COMMONWEALTH of VIRGINIA

Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the

York River and Lower York Coastal Basins

Public Comment Draft
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Table of Contents

I. Introduction and Background

This ***Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the York River and Lower York Coastal Basins*** reflects a continuation of Virginia's commitment to improving local water quality and the water quality and living resources of the Chesapeake Bay. With its roots in the 1983 creation of the Chesapeake Bay Program the strategy builds on previous efforts and looks to shape actions in a large and diverse watershed over the next seven years and beyond. The reduction goals are far greater than any set before.

Developed through a partnership between natural resources agencies and local stakeholders, this strategy provides options for meeting ambitious reductions in nitrogen, phosphorus and sediment and outlines future actions and processes needed to maintain these levels in the face of a growing population.

At 2,669 square miles, the York is among the smallest of Virginia's Chesapeake Bay watersheds. However, population there grew from about 250,332 in 1994 to 263,633 in 2000, making it among the bay's fastest growing watersheds in terms of population

In addition to the York River watershed, this strategy also covers the adjoining Lower York Coastal Basins: Piankatank River and Mobjack Bay. A successful nutrient and sediment reduction strategy will have significant impacts on water quality in the creeks, streams and rivers that feed the York River and the Lower York Coastal Basin. Likewise, along with strategies being developed for other Bay tributaries in Virginia, Maryland, Pennsylvania, West Virginia, New York and Delaware, they will have a cumulative effect on the waters and living resources of the Chesapeake Bay.

The Bay is North America's most biologically diverse estuary, home to more than 3,600 species of plants, fish and animals. Approximately 348 species of finfish, 173 species of shellfish and more than 2,700 species of plants live in or near the Bay. It also provides food and shelter for 29 species of waterfowl, and more than one million waterfowl winter annually in the basin.

The plight and status of these species shows that without improved water quality their numbers will continue to decline. With striped bass as an example, it has been shown that they will respond to the proper management practices.

A history of restoration

In the early 1980s, the Chesapeake Bay was a resource in severe decline. Water quality degradation played a key role in the decline of living resources in the Bay and its tidal tributaries.

In 1983, the governors of Virginia, Maryland and Pennsylvania were joined by the mayor of Washington, D.C., the U.S. EPA administrator and the chairman of the tri-state legislative Chesapeake Bay Commission to sign an agreement working toward the restoration of the Chesapeake Bay. This agreement created a multi-jurisdictional, cooperative partnership known as the Chesapeake Bay Program. The program sought to restore the Bay and its resources through cooperation and shared actions.

An over abundance of nutrients was identified as the most damaging water quality problem facing the Bay and its tributaries. High levels of nutrients, primarily phosphorus and nitrogen, over-fertilize the Bay waters, causing excess levels of algae. These algae can have a direct impact on submerged aquatic vegetation by blocking light from reaching these plants. More importantly, these algae have an indirect effect on levels of dissolved oxygen in the water. As algae die off and sink to the bottom, the resulting process of biological decay robs the surrounding bottom waters of oxygen, needed by oysters, fish, crabs and other aquatic animals.

The 1987 Bay Agreement recognized the role nutrients played in the Bay's problems and committed to reducing annual nitrogen and phosphorus loads into Bay waters by 40 percent by 2000. It was estimated that a 40 percent reduction would substantially improve the problem of low dissolved oxygen, which affects the Bay and many of its tributaries.

Nutrient reduction tributary strategies initiated

In 1992, Virginia joined her Chesapeake Bay Program partners in determining that the most effective means of reaching that water quality goal would be to develop tributary-specific strategies in each Chesapeake Bay river basin.

The tributary strategy approach is born of the realization that our actions on the land have a major impact on the waters into which they drain. This is particularly true in the 64, 000 square mile Chesapeake Bay watershed, where the ratio of land to water is 14:1. This approach also allowed stakeholders in each basin to address its mix of pollutants from point sources (i.e. wastewater treatment plants and industrial outflows) and nonpoint sources (runoff from farms, parking lots, streets, lawns, etc.).

Late in 1996, Virginia released its first tributary strategy, the ***Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy***. The result of more than three years of work, the strategy was developed cooperatively with local officials, farmers, wastewater treatment plant operators and other representatives of point sources and nonpoint sources of nutrients in the basin. As a result of the strong support for this grass-roots approach, the 1997 Virginia General Assembly adopted the Water Quality Improvement Act to provide cost-share funding for implementation of tributary strategies.

Stakeholders within the watershed published the original ***York River and Lower York Coastal Basins Tributary Nutrient Reduction Strategy*** in February 2000 after several years of collaborative work. The primary purpose of the original strategy was to restore habitat conditions, particularly dissolved oxygen and underwater vegetation, in order to support living resources in the York River, its tributaries and the lower York coastal basins.

The 2000 strategy observed that high levels of nutrients (nitrogen and phosphorus) and sediments seriously impaired the capacity of the York River and its tributaries to support living resources. According to the 2000 strategy, about 80 percent of the nutrients emptying into the York came from nonpoint sources, including surface runoff from farms, residential lands and other urban areas, with the remaining 20 percent coming from point sources, such as wastewater treatment and industrial plants. A suite of point and nonpoint management measures was recommended to reduce the harmful nutrient and sediment loadings. If fully implemented, the 2000 recommended measures would achieve reductions of 2.3 million pounds of nitrogen, 60,000 pounds of phosphorus and 9,000 tons of sediment by the year 2010. The cost to implement the measures was estimated at just over $45 million over 10 years.

Chesapeake 2000, A Watershed Partnership

While progress was being made in removing nutrients from the waters throughout the Chesapeake Bay watershed as the result of tributary strategies, nutrient enrichment remained a problem in the Bay's tidal waters. Beginning in 1998, the U.S. Environmental Protection Agency proposed implementation of a TMDL (Total Maximum Daily Load) regulatory program under Section 303(d) of the Clean Water Act to address nutrient-related problems in much of Virginia's Chesapeake Bay and tidal tributaries. In May 1999, EPA included most of Virginia's portion of the Bay and several tidal tributaries on the federal list of impaired waters based on failure to meet standards for dissolved oxygen and aquatic life use attainment.

In June 2000, members of the Chesapeake Executive Council signed a new comprehensive Bay Agreement. ***Chesapeake 2000, A Watershed Partnership*** is seen as the most aggressive and comprehensive Bay agreement to date. Designed to guide the next decade of Bay watershed restoration**,** ***Chesapeake 2000*** commits to "achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries and to protect human health." Meeting this commitment through a continuation of the Bay Program's voluntary, cooperative approach also alleviates the need for regulations to meet the same standards.

The new Bay agreement set out a process for achieving its water quality commitments that included setting increased nutrient reduction goals and the first Bay wide sediment reduction goals.

A living resources approach

This cooperative effort has resulted in nutrient reduction goals that are much more protective to the Bay and its tributaries than those agreed to in the past. Bay Program partners have agreed to base their success on the attainment of water quality standards, not simply pollution load reductions. These standards strive to meet established criteria for the Bay's designated uses. Bay partners chose designated uses based on living resources' habitat needs – shallow water, open water, deep water, deep channel and migratory and spawning areas.

For the first time, partners developed criteria that take into account the varying needs of different plants and animals and the various conditions found throughout the Bay. The criteria are:

- **Water clarity** – which ensures that enough sunlight reaches underwater bay grasses that grow on the bottom in most shallow areas.
- **Dissolved oxygen** – which ensures that enough oxygen is available at the right time during the right part of the year, to support aquatic life, including fish larvae and adult species.
- **Chlorophyll a** – the pigment contained in algae and other plants that enables photosynthesis. Optimal levels reduce harmful algal blooms and promote algae beneficial to the Bay's food chain.

In addition to being the focus for the reduction goals or allocations for tributary strategies, these criteria will serve as the basis for the revision of water quality standards for Virginia's tidal waters. This regulatory action is taking place simultaneously to the tributary strategy process. A notice of intended regulatory action (NOIRA), the first step in the regulatory process to amend water quality standards, was published in the Virginia Register on November 17, 2003. The Department of Environmental Quality is using a participatory approach, to more fully involve the public, in development of the new/revised tidal water quality standards. A Technical Advisory Committee of interested stakeholders has been formed and is meeting monthly. A set of draft water quality standards is expected for presentation to the State Water Control Board early this summer, with a request to release them to the public for review and comment. Final state adoption of the standards is scheduled by the end of 2005, to become effective in early 2006, after approval by the U. S. Environmental Protection Agency. More information on this process can be found at **http://www.deq.state.va.us/wqs/pdf/NOIRABay.pdf**

Using Computer Models to Determine Allocations

To determine optimal nutrient and sediment allocations, Bay watershed partners developed several simulations for analysis by the Chesapeake Bay Watershed and Water Quality models. Each simulation, or scenario, allows Bay scientists to predict changes within the Bay ecosystem due to proposed management actions taking place throughout the Bay's 64,000-square-mile watershed.

Information is entered into the Watershed Model, which details likely results of proposed management actions. These actions range from improving wastewater treatment technology to reducing fertilizer or manure application on agricultural lands to implementing sound land use programs to planting streamside forest buffers.

Next, these results are run through the Bay Water Quality Model, a complex mathematical model that provides Bay scientists with a visualization of future Bay and river water quality conditions resulting from each scenario. Throughout the development of the new Bay water quality criteria, more than 70 Water Quality Model runs were conducted.

As described above, the Chesapeake Bay Watershed and Water Quality models are powerful tools that help guide the level of effort and the types of actions needed to restore the health of the Bay and its tributaries. Understanding the strengths and limitations of these models is critical to efficiently and effectively targeting implementation efforts.

Estimating existing and future nitrogen and phosphorus loads is a key application of the watershed model. Incorporating good data and monitoring information, this model is well suited to provide these estimates.

Due, in part, to data limitations, sediment transport is simplified and sediment loads from eroding stream banks are not well captured. These limitations need to be addressed in future model versions. Moreover, these limitations need to be considered in determining ongoing implementation priorities. For example, storm water retrofits and stream restoration efforts may be more effective than is currently indicated by the model.

Regardless of certain limitations, the Chesapeake Bay Watershed and Water Quality models provide a good basis for making basing restoration decisions. Moreover, these models compliment and support other tools such as water quality assessment and watershed planning activities.

At the agreed allocations, the model predicts that we will see a Bay similar to that in the 1950s. Proposed water quality standards will be met in 96 percent of the Bay at all times, and the remaining four percent would fall shy of fully meeting the proposed standards for only four months a year.

The resulting nutrient reduction goals, or allocations, call for Bay watershed states to reduce the amount of nitrogen entering the Bay and its tidal tributaries from the current 285 million pounds to no more than 175 million pounds per year, and phosphorus from 19.1 million pounds to no more than 12.8 million pounds per year. When coordinated nutrient reduction efforts began in 1985, 338 million pounds of nitrogen and 27.1 million pounds of phosphorus entered the Bay annually.

When achieved, the new allocations will reduce annual nitrogen loads by 110 million pounds and phosphorus by 6.3 million pounds from 2000 levels and will provide the water quality necessary for the Bay's plants and animals to thrive.

The Virginia tributary strategy approach

Using the modeling process described, Bay Program partners then determined specific allocations for each major basin. Allocations for basins that cover more than one state were divided by jurisdiction.

The new cap allocation for total nitrogen in the York River is 5.7 millions pounds per year, compared with an actual load of 8.0 million pounds in 2000. The new cap allocation for phosphorus is 480,000 pounds, compared with an actual load of 790,000 pounds in 2000. The new cap allocation for sediment in the upper York basin is 90,000 tons per year, compared with 130,000 tons in 2000. This sediment allocation does not include loading from shoreline erosion.

To reach these ambitious new reduction goals, the current tributary strategy must build on previous water quality improvements, in particular, those outlined in the 2000 York River strategy. Many of the stakeholder groups involved in developing the previous strategy were active in working with state natural resource agency staff in creating this nutrient and sediment reduction plan.

The strategy looks at the agricultural nonpoint source practices and wastewater treatment plant reductions that were critical to the 2000 plan to see where practices could be increased. This strategy also looks more closely at measures involving land use, urban nutrient management and stormwater management that will need to play key roles in meeting the new basin allocations.

This strategy identifies a number of nonpoint source best management practices (BMPs) and point source treatment levels that can be implemented to meet the York's allocations. However, the strategy also recognizes the need for reduction efforts to grow and expand in order to meet the 2010 goal and to maintain or cap the allocation once it is achieved. In short, implementation planning that improves local water quality throughout the Chesapeake Bay basins will be a continuous process into the future.

In this regard, the strategy outlines processes that need to be developed in order to facilitate implementation between now, 2010, and beyond. There will be annual progress updates and a more thorough, Bay-wide evaluation of advancement towards the 2010 goals when an updated version of the Watershed Model becomes available, which is expected in 2006.

Implementation planning as outlined in this strategy will be continually refined, addressing both point and nonpoint sources. It must identify roles and responsibilities for federal, state and local governments, the private sector, nonprofits and the average citizen. The strategy addresses the need to establish timeframes and make cost estimates, in addition to identifying potential funding sources.

Tributary strategy implementation will be an iterative process bringing greater consideration of water quality issues to many sectors in each community as time goes by. Recognizing how land use and lifestyle can impact water quality, and finding alternatives to reduce those impacts, are objectives of tributary strategies. Marketing social change of this magnitude is a challenge that Virginia will deal with steadily using a variety of approaches. Reaching millions of individuals with these messages will take time and money, and there must be enduring popular support among the citizens and elected leaders across the watershed.

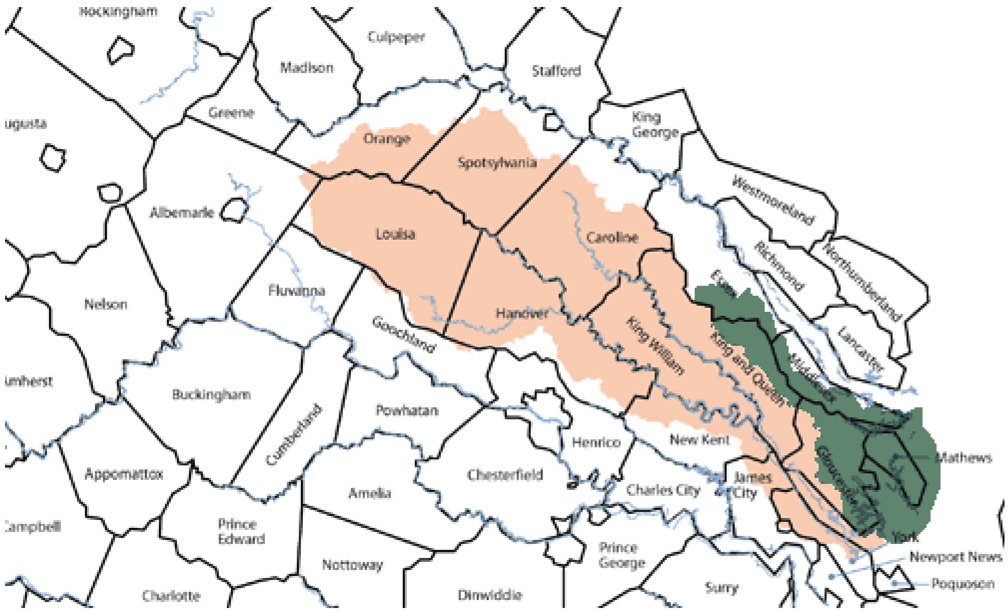
Ongoing tributary strategy implementation cannot be seen as a process that is separate from other ongoing water quality initiatives. In fact, tributary strategies should be seen as a way to connect and incorporate local water quality initiatives.

For example, many counties, some aided by local conservation nonprofit organizations, are developing local watershed management plans in their communities. These plans look at sub-watersheds of the tributary as a whole when planning new development or assessing other impacts on land and water resources. Planning at this scale reveals where individual BMPs are needed within each community in the basin. Locations for the many nonpoint sources BMPs in the tributary strategy can be determined using this technique. These local watershed plans can play key roles as a part of the implementation of a basin wide tributary strategy.

Likewise, mandated plans to restore stream segments on the federal impaired waters list, known as TMDLs, can also be part of a larger tributary strategy. These TMDLs deal with stream segments that violate water quality standards for specific impairments such as bacteria, pH or dissolved oxygen. They do not specifically address nutrient or sediment impairments. However, the implementation plans for upstream TMDLs will help to lessen nutrient and sediment loads. So, those measures included in TMDL implementation may be incorporated into the larger tributary strategy for that river basin.

II. The York River Watershed

YORK RIVER & LOWER YORK COASTAL BASIN



York River Watershed Fast Facts

- *Drainage Area in Acres: 1,707,841*
- *Square Miles: 2,668.5*
- *6.24 percent of Virginia's land base*
- *Length of York River: 36 miles. This is the length of the York River proper, from West Point (confluence of Mattaponi and Pamunkey rivers) to the mouth. The length of the watershed is about 200 miles, from the headwaters of the North Anna River and Pamunkey Creek to the mouth*
- *Counties: 17*
- *Towns: Ashland, Hanover, West Point, Gloucester, Gloucester Point, Yorktown*
- *2000 Population: 263,633*
- *Headwaters: North Anna River and Pamunkey Creek*
- *Larger Tributaries: Mattaponi, Pamunkey, North Anna, South Anna rivers*
- *Land Use: 70 percent forest, 20 percent agriculture, 10 percent urban.*

Major pollutants and water quality

The three major pollutants targeted in the tributary strategy process are nitrogen, phosphorus and sediment. Approximately 85 percent of the nitrogen and 81 percent of the phosphorus loads to the tidal York River originate from nonpoint sources. Most nonpoint source pollutants are runoff from agricultural lands, residential lands and other urban areas. The remaining 15 percent of the nitrogen and 19 percent of the phosphorus loads come from point source discharges (municipal sewage and industrial wastewater plants). Soil erosion is considered 100 percent nonpoint source related. It comes mainly from construction sites and stream banks.

Water quality impacts from excessive inputs of nutrients and sediment include periodic low levels of dissolved oxygen near the mouth of the York and diminished acreage and health of underwater grasses throughout the tidal portion of the river.

This section presents a general overview of selected water quality conditions in the York River. A more detailed water quality analysis for the Rappahannock can be found in Appendix A. In addition, a much more comprehensive and detailed analyses are available for each major Bay basin, and the reader is encouraged to supplement this brief status and trends information with several reports available through the DEQ Chesapeake Bay Program webpage www.deq.state.va.us/bay/wqifdown.html and the DEQ Water Programs' Reports webpage www.deq.state.va.us/water/reports.html.

Water quality conditions are presented through a combination of the current status and long-term trends for nitrogen, phosphorus, chlorophyll, dissolved oxygen, water clarity, and suspended solids. These are the indicators most directly affected by nutrient and sediment reduction strategies. Environmental information regarding other important conditions in Chesapeake Bay (e.g., underwater grasses, fisheries, chemical contaminants) are available in the 2004 biennial report, "Results of Monitoring Programs And Status of Resources", available via the webpage for the Secretary of Natural Resources at www.naturalresources.virginia.gov.

Most of Virginia's Chesapeake Bay is showing improving trends in nitrogen, with a few exceptions including the degrading trends seen at the Pamunkey watershed input station and further downstream. Status of nitrogen in much of the York River is considered relatively good, in comparison to conditions in the other major tributaries and the Virginia Chesapeake Bay. Some of Virginia's Bay waters have the poorest conditions in relation to the rest of the Chesapeake Bay system, including a portion of the Mattaponi and the tidal fresh section of the York River. The status of other downstream segments of the York River is fair, but degrading trends are seen in sections of the Pamunkey, tidal fresh York and further downstream. A degrading trend has been noted at the Pamunkey watershed input station.

Regarding chlorophyll, parts of all of the major Virginia tributaries, including the York, have poor status in relation to Bay-wide conditions. A degrading trend in chlorophyll was detected in the lower reaches of the Mattaponi and Pamunkey Rivers, as well as the mainstem York. About half of the Virginia Chesapeake Bay and smaller portions of the tidal tributaries had only fair status. The lower York River and lower reach of the Mattaponi are also indicated as fair status. In the lower York, this is due to depressed dissolved oxygen concentrations periodically found in the deep sill that exists near the mouth of the river. These deep sills and trenches have naturally lower dissolved oxygen levels, but the area affected and duration of low dissolved oxygen levels has been made worse by anthropogenic nutrient inputs.

There are scattered areas of improving conditions for dissolved oxygen and no areas of degrading trends. All of the tributaries have areas of improving conditions. These improvements are a result of both the nutrient management efforts and natural factors, such as declining riverflow, which in turn has lead to less nutrient inputs and concurrently higher influxes of cleaner oceanic water.

Water clarity status of many segments within the tributaries and the Chesapeake Bay mainstem is only fair or poor, and this is evident in the York basin, with fair status in the Mattaponi and Pamunkey Rivers, and poor status along the York River and in Mobjack Bay. This suggests that poor water clarity is one of the major environmental factors inhibiting the resurgence of underwater grasses in Chesapeake Bay. Degrading trends in water clarity were detected over a wide geographic area within Virginia's tributaries and Chesapeake Bay, including the Mattaponi, mouth of the York, and Mobjack Bay. These degrading trends represent a substantial impediment to the recovery of grass beds within Chesapeake Bay. An improving trend in water clarity was evident in the Pamunkey River. Possible causes of the degrading trends include increased shoreline erosion as a result of waterside development, loss of wetlands, increased abundance of phytoplankton, or a combination of sea level rise and land subsistence. In relation to suspended solids, all of the major Virginia tributaries have segments that are fair or poor status, including the York River system (Mattaponi, Pamunkey, and York). The York basin has particularly widespread degrading trends for suspended solids, with the exception of Mobjack Bay. Both the Pamunkey and Mattaponi watershed input stations also showed degrading trends.

Demographics and land use

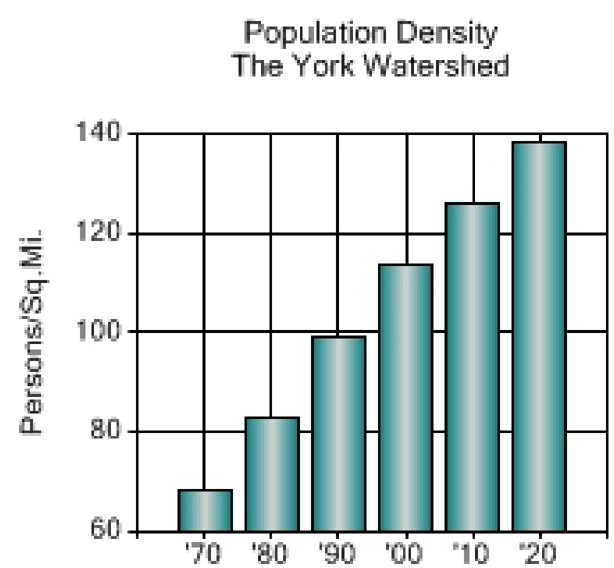
The York River basin lies in the central and eastern section of Virginia and represents about six percent of Virginia’s total area. The basin is bounded by the Rappahannock River basin to the north and the James River basin to the south. The headwaters of the York River are located in Orange County and the river flows in a southeasterly direction for approximately 200 miles, to its mouth at the Chesapeake Bay. The basin’s width varies from five miles at its mouth to 40 miles at its headwaters. The York basin is comprised of the York River and its two major tributaries, the Pamunkey and the Mattaponi and the land that drains into them. The York River proper is only about 30 miles in length. The Pamunkey River’s major tributaries include the North and South Anna Rivers and the Little River, while the Mattaponi River's tributaries are the Matta, the Po, and the Ni Rivers. The York coastal basins, which drain directly to the Chesapeake Bay, include the Piankatank River and Mobjack Bay.

Lying in the Coastal Plain and the Piedmont physiographic provinces, the basin's topography is characterized by rolling hills in the extreme western portion of the basin in and around the headwaters, to gently sloping hills and flat farmland near its mouth. Tributaries in the central Piedmont exhibit moderate and near-constant profiles. Streams in the Coastal Plain are characterized by their flat slope. The York watershed's relatively low overall gradient, compared to the other Virginia basins, scientists believe, implies that aggressive implementation of BMPs may be a particularly useful strategy in this basin for nutrient and sediment load reduction by increasing average residence times for treatment.

The York River basin includes all or parts of seventeen counties: Albemarle, Fluvanna, Goochland, Louisa, Orange, Spotsylvania, Caroline, Hanover, Essex, Gloucester, James City, King and Queen, King William, Mathews, Middlesex, New Kent, and York. Urban areas within the basin include the City of Williamsburg and fringes of Fredericksburg, Richmond, and Hampton Roads. Other urban areas include Gloucester, Yorktown, West Point, and Ashland.

As previously noted, the population has significantly increased in the last few years. The majority of this population still lives in largely rural settings and is, generally, evenly distributed throughout the basin. The population density in the York watershed is projected to increase by 21.4 percent between 2000 and 2020, see Figure 1.

Figure 1: Population Density in York Watershed



Source: Chesapeake Bay Program

In spite of the projected growth, the York basin remains a relatively undeveloped watershed. In 1985, the basin was 62 percent forested, with the remainder of land in the basin being 18 percent agricultural and 18 percent urban or mixed open lands (Figure 1). Figure 2 identifies moderate growth in the York basin and moderate land use changes. Based on 2010 projections, the York will continue to see minimal land use changes. Forested lands will see slight increases to 64 percent of the total land area, while agricultural lands will decrease to 16 percent of the land use. Urban and mixed open areas will see minimal increases to comprise 20 to 21 percent of the available land (Figure 3).

Figure 2: 1985 Land Use in York Watershed

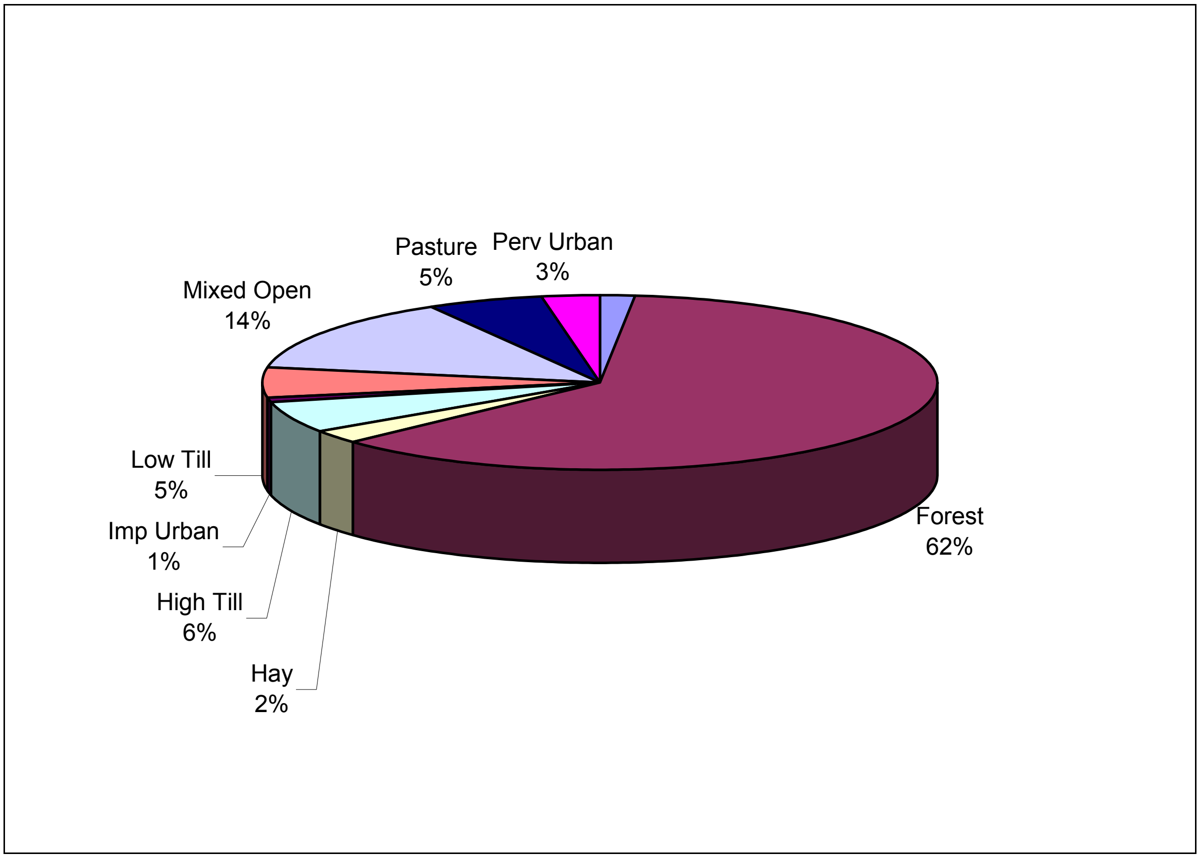


Figure 3: 2002 Land Use in York Watershed

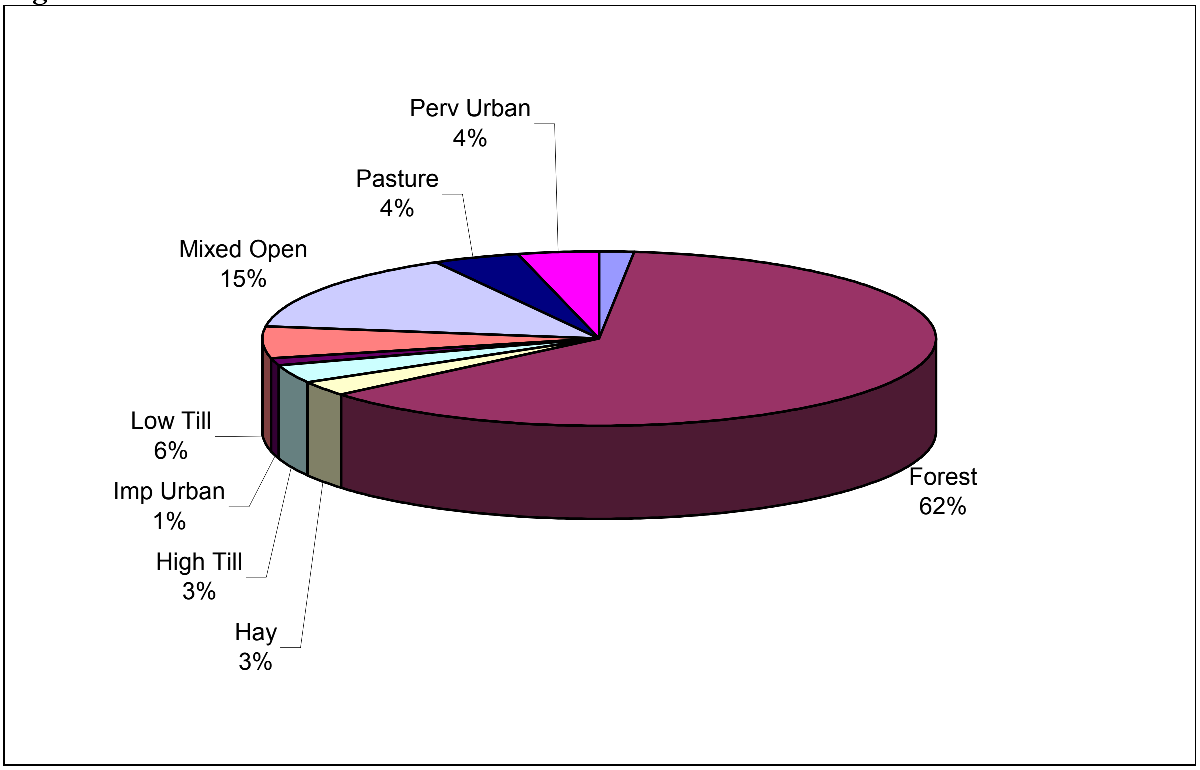
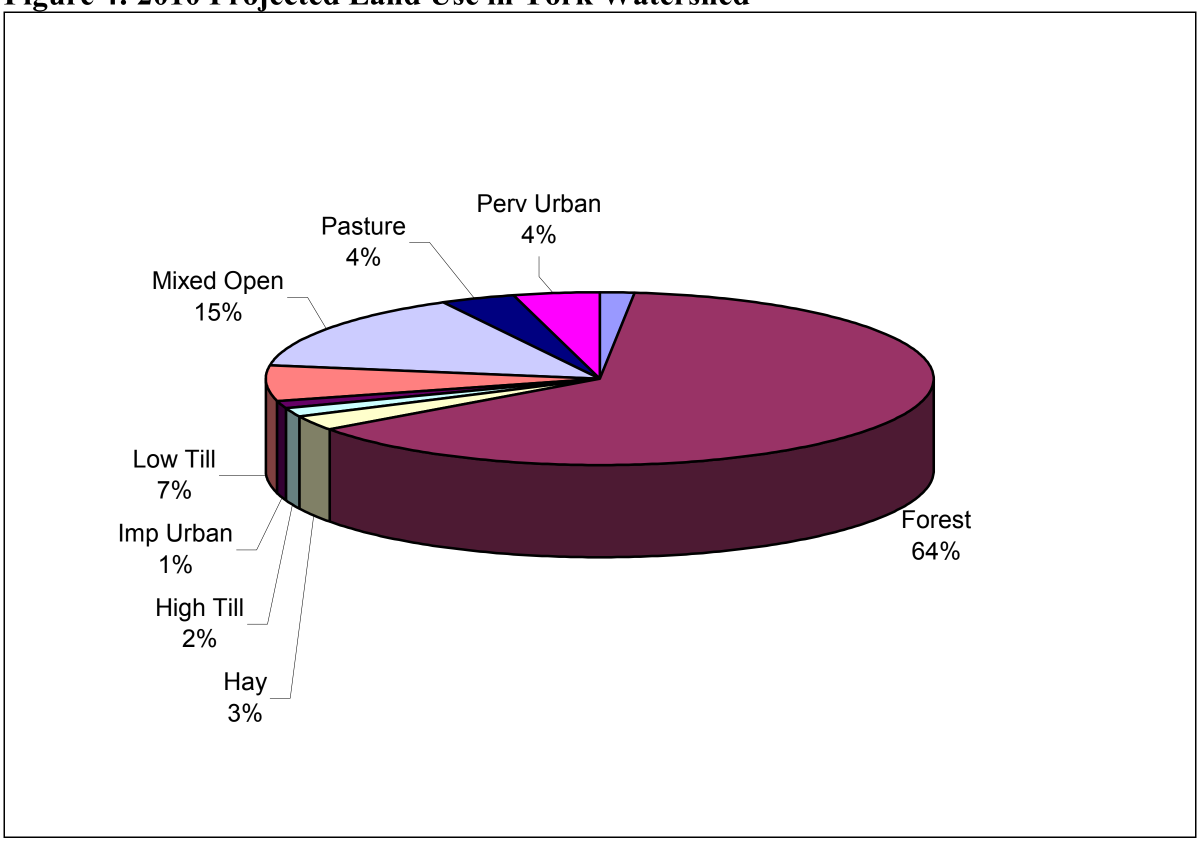


Figure 4: 2010 Projected Land Use in York Watershed



III. Strategy Practices and Treatments

Nutrient and sediment allocations and reduction goals

The York strategy is one of five developed for Virginia's Chesapeake Bay basins. While each basin had specific nutrient and sediment load allocations to reach, they are a part of overall Virginia Chesapeake Bay nutrient and sediment reduction goals. As the result of the efforts by state staff and stakeholders in all five basins Virginia has crafted a series of strategies that surpassed Virginia's nitrogen, phosphorus and sediment goals.

Table 1: Allocations and Scenarios by Basin and Statewide

	TN (LBS/YR)		
	2002 Progress	2010 VA Strategy	2010 Cap Load Allocation
Potomac	22,844,023	12,589,458	12,839,755
Rappahannock	7,899,245	5,309,703	5,238,771
York	7,679,383	5,362,111	5,700,000
James	37,258,742	24,518,310	26,400,000
Eastern Shore	2,122,892	948,292	1,222,317
VA TOTAL	**77,804,285**	**48,727,874**	**51,400,843**
	TP (LBS/YR)		
	2002 Progress	2010 VA Strategy	2010 Cap Load Allocation
Potomac	1,951,741	1,176,908	1,401,813
Rappahannock	954,358	692,870	620,000
York	749,445	538,103	480,000
James	5,952,375	3,486,427	3,410,000
Eastern Shore	227,205	86,734	84,448
VA TOTAL	**9,835,124**	**5,981,043**	**5,996,261**
	SED (TONS/YR)		
	2002 Progress	2010 VA Strategy	2010 Cap Load Allocation
Potomac	720,462	403,221	616,622
Rappahannock	335,183	247,000	288,498
York	126,987	97,999	102,534
James	1,174,351	791,403	924,711
Eastern Shore	22,036	8,002	8,485
VA TOTAL	**2,379,018**	**1,547,624**	**1,940,849**

Strategy development

As soon as nutrient and sediment allocations were received, stakeholder teams were formed in each of Virginia's major Chesapeake Bay tributary basins to guide and assist in preparing a strategy to meet the ambitious allocations. Efforts were made to ensure that the tributary teams formed were representative of the diverse stakeholder interests in the York watersheds. Team representatives include citizens, farmers, soil and water conservation districts, private industry, environmental groups, wastewater treatment plant operators, and local, state, and federal government agencies from both nonpoint and point sources of nutrient pollution. A complete listing of members and affiliations may be found in Appendix D.

Team members worked with state staff to review existing conditions in their basin in recommending a mix of nonpoint source practices and point source treatment levels. In their work they considered the existing structure, responsibilities and workload of the governmental and private entities that would be involved in implementing these practices. They worked within the framework of existing state laws, regulations and authorities. Even assuming optimal funding their initial mix of practices came up short of the basin's nutrient and sediment load allocations.

State staff then took the stakeholders work and added practices and treatments using as its only restrictions existing technologies, land availability, animal units and other variables related only to the practices themselves. They did not factor in government responsibilities, infrastructure or availability of funding.

This analysis showed that it is feasible to meet the imposing allocation goals set for each basin. However, it also showed that considerable analysis of the barriers to implementation need to be explored and addressed. This document will begin that exploration in Section IV.

Scenario results

As indicated in Table 2, the York meets the nitrogen and sediment goals, while falling slightly short of the phosphorus goal.

Table 2: York Cap Allocations and 2010 Scenario

		All Sources	NPS	PS
TN (lbs/yr)	Cap Allocation	5,700,000		
	Tributary Strategy	5,362,111	4,368,316	993,795
	2002 Progress	7,679,383	6,550,088	1,129,295
	1985	8,446,401	7,154,178	1,292,223
TP (lbs/yr)	Cap Allocation	480,000		
	Tributary Strategy	588,103	503,344	84,759
	2002 Progress	749,445	609,860	139,585
	1985	999,200	577,825	421,375
Sed (tons/yr)	Cap Allocation	102,534	102,534	
	Tributary Strategy	97,999	97,999	
	2002 Progress	126,987	126,987	
	1985	157,667	157,667	

As shown above, overall Virginia's reduction strategy met the reductions, while there were minor shortages at individual rivers. However, these discrepancies are generally within the model's margin of error, both above and below the cap allocations for nitrogen, phosphorus and sediment. In addition, the sediment goal was far exceeded, due to the interrelated nature of nitrogen, phosphorus, and sediment. Most of the practices defined in this strategy generally achieve reductions in all three constituents.

The Tributary Strategy relies on a suite of BMPs covering all land use categories, although it includes high implementation of specific practices that have significant impact on water quality, are cost effective, and/or are regionally popular. As outlined below and in Table 2, a large part of the Strategy relies upon significant load reductions on agricultural lands, primarily cropland. Additionally, upgrades at point source facilities will contribute to the load reductions, especially phosphorus reductions.

Nonpoint Source Input Deck summary

For the agriculture source category, the BMPs in the input deck focused on animal waste management systems, land conversion BMPs such as riparian forest buffers on cropland, hay and pasture (2.5 percent of available acres converted to forest buffers) and grass buffers on cropland (one percent of available acres converted to grass buffers). Other land conversion BMPs that were targeted included wetland restoration, tree planting (one percent of cropland, hay land and pasture acres converted to trees), and retirement of highly erodible cropland (one percent was retired). These land conversion BMPs have a greater effect on nitrogen, phosphorus, and sediment reductions with higher "pounds reduced per acre". Also, stream protection practices (off-stream watering with fencing, off stream watering without fencing, and off-stream watering with fencing and rotational grazing were targeted.

The agronomic practices such as conservation tillage, cover crops, farm plans and nutrient management were maximized; with 70 percent of the cropland in cover crops and 80 percent in conservation tillage. Farm plans were applied to 90 percent of the cropland, hay and pasture acres and nutrient management was applied to 95 percent of the cropland and hay acres. These practices are very cost effective and unlike the land conversion BMPs, multiple practices can be applied to a given acre, which helps to increase the nutrient and sediment reductions.

The BMPs targeted for the mixed open land use included forest buffers, wetland restoration, tree planting, and nutrient management planning. Forest buffers were applied to 2.5 percent of the mixed open acres, wetlands restoration was applied to one percent and tree planting was applied to one percent. Nutrient management planning was applied to 90 percent of the mixed open acres remaining after the land use conversions.

For the urban source category the stormwater BMPs that were targeted included wet ponds and wetlands, infiltration and filtering practices. These practices are more desirable than dry detention ponds and dry extended ponds because of higher nutrient removal. Forest buffers were applied to 2.5 percent of the pervious urban acres and one percent of the pervious urban acres were converted to trees. Nutrient management was applied to 90 percent of the pervious urban acres after accounting for the land conversion practices mentioned above.

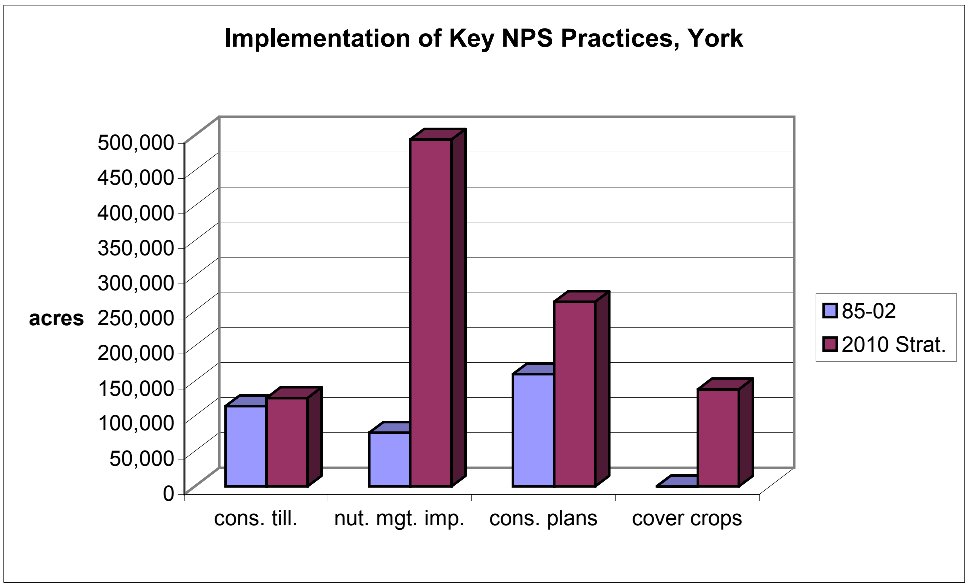
Forest harvesting practices were applied to the forestland use category. The acres treated by forest harvesting practices were based on reported data provided by the Virginia Department of Forestry.

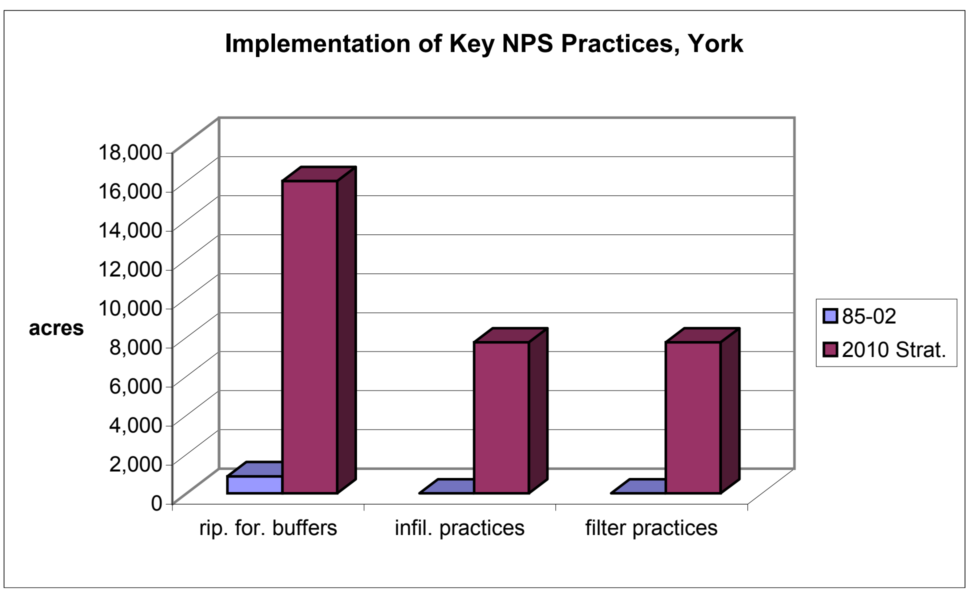
The BMPs that were applied to the septic source category included septic tank pump outs, and septic denitrification systems. The Chesapeake Bay Program provided projections as to the number of septic systems in operation by 2010. A septic tank pump out rate of 75 percent was used to calculate the number of pumpouts. Generally a 10 percent conversion to septic denitrification was applied, this would include retrofits of existing systems and new construction.

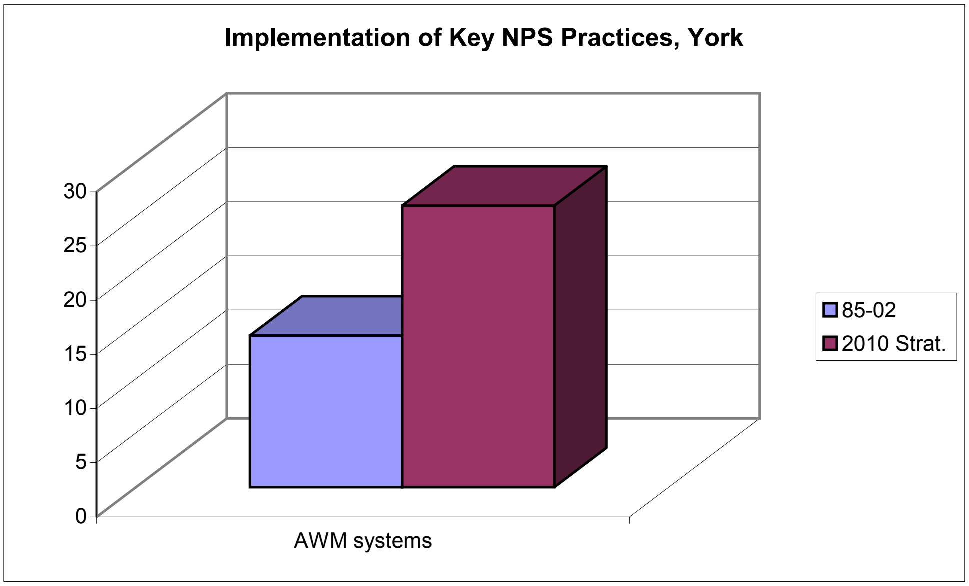
Table 3: Nonpoint Source Input Deck

Best Management Practice	Units	Amount
AGRICULTURAL PRACTICES:		
Animal Waste Management Systems/Barnyard Runoff Control	acres	26
Conservation Plans	acres	263,040
Conservation Tillage	acres	125,911
Cover Crops (early planting)	acres	138,239
Forested Buffer	acres	7,379
Grassed Buffer	acres	1,684
Horse Pasture Management	acres	14,589
Retirement of Highly Erodible Land	acres	2,230
Nutrient Management Plans	acres	200,429
Off-Stream Watering with Fencing	acres	13,914
Off-Stream Watering without Fencing	acres	6,957
Off-Stream Watering with Fencing and Rotational Grazing	acres	13,914
Tree Planting	acres	2,950
Wetland Restoration	acres	2,230
Yield Reserve	acres	520
NON-AGRICULTURAL PRACTICES:		
Erosion and Sediment Control	acres	5,067
Filtering Practices	acres	7,754
Forested Buffer	acres	8,651
Forest Harvesting Practices	acres	2,884
Infiltration Practices	acres	7,754
Mixed Open Nutrient Management Plans	acres	246,170
Septic Connections	acres	301
Septic Denitrification	acres	6,056
Septic Pumping	acres	45,419
Tree Planting	acres	3,459
Urban Nutrient Management Plans	acres	47,607
Wetland Restoration	acres	2,905
Wet Ponds and Wetlands	acres	7,754

The following bar charts compare implementation rates from the seventeen year 1985 to 2002 time period with those the strategy calls for during the seven years through 2010 for several key nonpoint source best management practices in the York River basin. Implementation rates for all of these practices, and many others, will need to increase dramatically. Practices that are already heavily used will still need to be increased. In some cases the strategy calls for practices that have previously seen little or no implementation in the basin. While the strategy looked at the whole suite of BMPs available, there are a few practices in each basin that are not being used. In these cases either land use or some other condition did not make that particular BMP applicable to that basin. However every effort was made to identify and maximize the use of all applicable practices.







Point Source Input Deck summary

The point source control levels proposed for the York facilities would result in annual discharged loads of approximately 1,085,900 pounds of nitrogen and 89,300 pounds of phosphorus, in the year 2010. While there are many combinations of treatment levels for the affected significant facilities that could reach these load levels, for simplicity and equity the input deck assumed uniform nutrient reduction treatment at the municipal plants, and equivalent controls at the industrial facilities. The significant municipal plants would achieve annual averages of 8 mg/l nitrogen and 0.5 mg/l phosphorus, coupled with projected flow levels for the year 2010. The industrial plants would reduce their current nitrogen and phosphorus concentrations by 50 percent.

Table 4: Point Source Input Deck

Facility	WSM Segment	Design Flow (MGD)	Trib Strat 2010 Flow (MGD)	Trib Strat TN Conc (mg/l)	Proposed 2010 TN Load (lbs/yr)	Trib Strat TP Conc (mg/l)	Proposed 2010 TP Load (lbs/yr)
Caroline Co. STP	240	0.50	0.30	8.0	7,310	0.50	457
Subtotal 240 =		0.50	0.30		7,310		457
Gordonsville STP	250	0.67	0.67	8.0	16,325	0.50	1,020
Subtotal 250 =		0.67	0.67		16,325		1,020
Ashland STP	260	2.00	1.55	8.0	37,767	0.50	2,360
Doswell STP	260	6.75	4.50	8.0	109,646	0.50	6,853
Subtotal 260 =		8.75	6.05		147,412		9,213
Giant Refinery	590	--	60.77	0.9	166,579	0.12	22,211
HRSD-York STP	590	15.00	12.70	8.0	309,444	0.50	19,340
Parham Landing	590	0.57	0.20	8.0	4,873	0.50	305
Smurfit-Stone	590	--	18.45	5.26	295,577	0.50	28,097
Totopotomoy STP	590	5.00	5.00	8.0	121,828	0.50	7,614
West Point STP	590	0.60	0.60	8.0	14,619	0.50	914
Subtotal 590 =		21.17	97.72		912,921		78,480

Mathews C.H. STP	940	0.10	0.08	8.0	1,949	0.50	122
Subtotal 940 =		0.10	0.08		1,949		122
Totals =		31.19	104.82		1,085,917		89,292

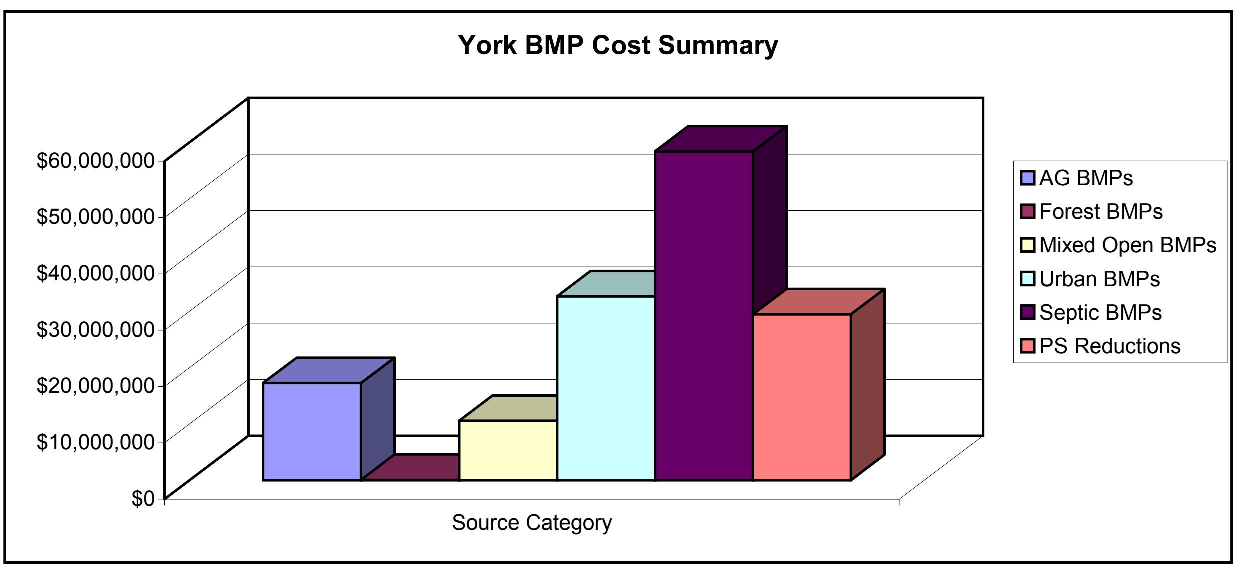
This scenario does not set load allocations for each individual plant -- what is sought is an aggregate point source load across the entire York basin that the plants would maintain into the future. The process for setting the individual plant allocations, and procedures to establish numerical discharge permit limits for nutrients will be informed and assisted under a rulemaking now underway to revise the State Water Control Board's "Point Source Policy for Nutrient Enriched Waters." Information on revising this regulation can be found on the DEQ Chesapeake Bay Program's webpage, at this Internet address: www.deq.state.va.us/bay/multi.html.

Cost estimates

The total costs to implement the tributary strategies for the Virginia portion of the Chesapeake Bay is $3.2 billion. The estimated total for the York basin is $162 million. These estimates included point sources, nonpoint sources, and technical assistance costs to implement the nonpoint source reductions required.

Cost estimates are provided for both nonpoint and point sources for each of the tributary strategy basins. The York estimates are broken down according to source category in the bar chart below. A more detailed summary is also provided in Table 5, showing the number of BMPs and amount of point source reductions for each basin. However, the total in Table 5 does not include the technical assistance costs calculated into the estimate stated above.

Cost Estimates By Source Category



Nonpoint source costs

The nonpoint source costs are based on structural costs to implement BMPs for the source categories: agriculture, urban, mixed open, septic and forest. The cost estimates considered structural costs to implement BMPs, costs for services to implement BMPs such as nutrient management planning, septic pumping, etc., and materials and equipment usage costs to implement BMPs such as the agronomic practices for agriculture (i.e., cover crops, and conservation tillage). Technical assistance costs were also calculated and added to the BMP cost to obtain the total implementation costs. (See Table 7) Maintenance costs were not included in the estimates.

The sources of information used to develop the cost estimates were as follows:

- Chesapeake Bay Program, Use Attainability Group Report, "Economic Analyses of Nutrients and Sediment Reduction Actions to Restore Chesapeake Bay Water Quality" (primary reference source). Urban BMP costs were taken from this source along with a small number of agricultural practices.

- Virginia's Agricultural Cost-Share Program Tracking Database, period of record was 1998-2002. Stream fencing practices were adjusted based on 2002 data.

- DCR's staff was consulted for nutrient management costs, erosion and sediment control costs, and the cost to transfer poultry litter.

- Study by Virginia Polytechnic Institute and State University and the United States Department of Agriculture was used for the forest harvesting practices.

The cost for the septic BMPs – connection to public sewer and septic tank pumping were based on information from nonpoint source implementation projects funded by DCR. Costs for the installation of a septic denitrification system was based on the assumption that most of the systems accounted for in the tributary strategy would be for new construction as compared to replacement of failing conventional on-site sewage disposal systems. The average cost figure for a denitrification system is $12,565 and the average cost for a conventional system is $4,500. The difference of $8,065 was used to calculate the cost for the advanced treatment to obtain the additional nitrogen removal per system.

Point source costs

The point source capital costs are planning level, order-of-magnitude figures (accurate from -30% to +50%), based on a combination of owner-furnished data and results from an estimation methodology developed by the Chesapeake Bay Program's Nutrient Reduction Technology (NRT) Workgroup. This Workgroup included state and federal staff, several treatment plant owners, academia, and two experienced and respected consulting engineering firms. More accurate figures can only be determined through specific facility planning, design, and ultimately construction bids for the necessary treatment upgrades.

The NRT methodology included assumptions about treatment types, plant sizes, and needed unit processes, to reduce nitrogen and phosphorus in order to meet three annual average discharge performance "tiers":

- Biological Nutrient Removal (BNR): TN = 8.0 mg/l; TP = 1.0 mg/l
- Enhanced Nutrient Removal (ENR): TN = 5.0 mg/l; TP = 0.5 mg/l
- Limit-of-Treatment (LOT): TN = 3.0 mg/l; TP = 0.1 mg/l

It is recognized that if a particular treatment level is chosen to meet a basin load allocation in the year 2010, it is probable that more stringent treatment will be needed to maintain the reduced load into the future. This is the case where a plant has not yet reached its design capacity in the year 2010, but must "cap" its discharge load as flows increase.

The point source cost estimates were developed using the "tier" that most closely matched the proposed level of treatment in each tributary strategy planning area. As a result, it is possible that the cost figures are under-estimated. This is due to the fact that some plant owners could chose to install a more stringent treatment process now, to maintain a "cap" load at the design capacity, rather than meeting an interim 2010 load goal and potentially face multiple construction projects to retrofit their plant. The most conservative cost estimate (i.e., highest cost, associated with limit-of-treatment technology) was used only for the municipal plants in the northern Virginia portion of the Potomac basin (excepting Upper Occoquan Sewage Authority), and municipal dischargers to the tidal-fresh portion of the Middle James basin (excepting Hopewell).

Table 5. Summary of Costs By Source Category

York Basin Estimated BMP Cost Summary

Agricultural BMPs	Cost Units	Cost/Unit	Basin Costs
Conservation-Tillage	$/Acre	$3	$35,053
Forest Buffers	$/Acre	$545	$3,541,190
Wetland Restoration	$/Acre	$889	$1,982,470
Land Retirement	$/Acre	$928	$506,688
Grass Buffers	$/Acre	$175	$252,496
Tree Planting	$/Acre	$108	$318,600
Nutrient Management Plans	$/Acre	$7	$871,643
20% Poultry Litter Transport	$/Wet Ton	$12	$0
10% Livestock Manure Transport	$/Wet Ton	$12	$0
Conservation Plans	$/Acre	$7	$720,830
Cover Crops (Early-Planting)	$/Acre	$19	$0
Cover Crops (Late-Planting)	$/Acre	$19	$2,618,162
Off-Stream Watering w/ Fencing	$/Acre	$284	$3,909,420
Off-Stream Watering w/o Fencing	$/Acre	$152	$1,057,464
Off-Stream Watering w/ Fencing & RG	$/Acre	$186	$1,023,269
Stream Stabilization	$/Acre	$12	$0
Animal Waste Management	$/Acre	$32,278	$397,295
Yield Reserve	$/Acre	$30	$15,600
30% Poultry Phytase	N/A	$0	$0
Total Cost for Agricultural BMPs			**$17,250,180**

Point Source Reductions	Cost
Phosphorus Reductions	$699,005
Nitrogen Reductions	$28,766,183
Total Costs for Point Source Reductions	**$29,465,188**

Basin Total*	**$148,356,442**

*Does not include Technical Assistance

Urban BMPs	Cost Units	Cost/Unit	Basin Costs
Wet Ponds & Wetlands	$/Acre	$820	$6,358,280
Dry Det Ponds & Hyd Struct	$/Acre	$820	$0
Dry Ext Det Ponds	$/Acre	$820	$0
Urban Infiltration Practices	$/Acre	$820	$6,358,280
Urban Filtering Practices	$/Acre	$820	$6,358,280
Urban Stream Rest	$/Mile	$63,360	$0
Urban Forest Buffers	$/Acre	$108	$149,796
Urban Tree Planting	$/Acre	$108	$59,832
Urban Nutrient Management	$/Acre	$15	$703,742
Urban Growth Reduction	$/Acre	$22	$0
Erosion & Sediment Control	$/Acre	$2,500	$12,667,500
Total Cost for Urban BMPs			**$32,655,710**

Mixed Open BMPs	Cost Units	Cost/Unit	Basin Costs
Wetland Restoration	$/Acre	$889	$2,582,545
Tree Planting	$/Acre	$108	$313,740
Mixed Open Nutrient Management	$/Acre	$15	$3,692,550
Forest Buffers	$/Acre	$545	$3,958,880
Total Cost for Mixed Open BMPs			**$10,547,715**

Forest BMPs	Cost Units	Cost/Unit	Basin Costs
Forest Harvesting Practices	N/A	$21	$60,708
Total Costs for Forest BMPs			**$60,708**

Septic BMPs	Cost Units	Cost/Unit	Basin Costs
Septic Denitrification	$/System	$8,065	$48,841,640
Septic Pumping	$/System	$200	$9,083,800
Septic Connections	$/System	$1,500	$451,500
Total Cost for Septic BMPs			**$58,376,940**

Table.6 6-Year Timeline, Annual Implementation Levels and Technical Assistance for Nonpoint Sources.

Date (year)	Agriculture (%)	Urban (%)	Mixed Open (%)	Septic (%)	Forest (%)	Ag. TA (%)	Urban, MO TA (%)	Septic, Forest TA (%)
1	10	15	10	15	15	10	20	5
2	15	15	15	15	15	10	20	5
3	15	15	15	15	15	10	20	5
4	20	15	20	15	15	10	20	5
5	20	20	20	20	20	10	20	5
6	20	20	20	20	20	10	20	5

Provided in the table above is a level of implementation based on a projected percentage of the total BMPs by source category that would have to be implemented yearly to achieve the tributary strategies by 2010. These percentages were used to project the structural costs on an annual basis for each of the nonpoint source categories to implement the tributary strategies. Also, included in the table is factors (expressed as a percentage) used to estimate the technical assistance costs to implement the tributary strategies. The agricultural technical assistance costs was based on 10 percent of the structural cost, the urban and mixed open (MO) technical costs were based on 20 percent of the structural costs, and septic and forestry technical costs were based on 5% of the structural cost.

The technical assistance costs are based on a uniform percentage over the six year implementation period. The percentages of yearly implementation of BMPs were adjusted to account for the expectation that the implementation levels in the earlier years will not be as great as compared to the later years due to an initial time lag. This is anticipated as a result of putting into place more technical assistance, making programmatic and regulatory changes, improving implementation reporting and tracking efforts, and obtaining substantial amounts of funding.

York River Basin							
	Imp Yr 1	Imp Yr 2	Imp Yr 3	Imp Yr 4	Imp Yr 5	Imp Yr 6	Totals
Agriculture BMPs	1.725	2.588	2.588	3.450	3.450	3.450	17.250
Urban BMPs	4.898	4.898	4.898	4.898	6.531	6.531	32.656
Mixed Open BMPs	1.055	1.582	1.582	2.110	2.110	2.110	10.548
Septic BMPs	8.757	8.757	8.757	8.757	11.675	11.675	58.377
Forest BMPs	0.009	0.009	0.009	0.009	0.012	0.012	0.061
Agriculture TA $	0.173	0.259	0.259	0.345	0.345	0.345	1.725
Urban & Mixed Open TA $	1.191	1.296	1.296	1.402	1.728	1.728	8.641
Septic & Forest TA $	0.438	0.438	0.438	0.438	0.584	0.584	2.922
Total Basin Estimated NPS Cost including Technical Assistance							132.179

* Cost in Millions of Dollars

IV. Implementing the Strategies: A Message from the Secretary of Natural Resources

This strategy and similar strategies prepared for Virginia's Chesapeake Bay tributaries propose a suite of nonpoint source best management practices, sewage treatment plant upgrades and other actions necessary to achieve the specified nutrient and sediment reductions. The analysis and practices contained in this strategy are an important first step and bring together state and regional goals informed by an understanding of local conditions as developed by the tributary teams. However, as the input decks outlined in the previous section of this document make clear, achieving the necessary implementation levels go far beyond what we have previously seen. In order for these strategies to be meaningful, we must identify what additional resources and tools are necessary to achieve and cap these nutrient reductions in the timeframe called for by the Chesapeake 2000 Agreement. We must also further refine these strategies with specific information regarding implementation budgets and timetables.

The citizens of Virginia should receive this clear message. Restoration of the Chesapeake Bay is possible but it will not come without substantial public and private resources and programs that ensure that management practices are adopted and maintained. Without such actions, the promises we have made have no meaning. Without such actions, the economic and environmental benefits of a restored bay will not be realized.

The tributary teams have raised a variety of issues regarding implementation, tracking and cost and those questions need to be addressed as we move forward. The purpose of this chapter is to build on those issues and outline in broad terms the implementation approach for these strategies. During the public comment period and beyond, the public is invited to offer comments and provide guidance on the issues and questions that follow.

Funding

Part Three of this strategy outlines the magnitude of funding necessary to address the various sources of nutrient and sediments. It is clear that implementation of these strategies will require financial resources that are far beyond those currently available. Governor Warner has proposed a dedicated source of funds for water quality improvement and land conservation, however the current stalemate in the state budget process has put the Governor's proposal as well as funds proposed by the Senate in doubt.

There is also activity at the regional level. The Chesapeake Executive Council has appointed a high level panel to address funding issues. Chaired by former Virginia Governor Gerald Baliles, the panel has begun its deliberations is expected to release its findings and recommendations in October 2004.

As part of its review of this and the other strategies, the public is invited to address the funding issue with suggestions on how additional funding can be obtained to implement this strategy. In the meantime, efforts to target existing resources will be pursued. These strategies provide the basis for evaluating the areas with greatest need.

Point source implementation

Implementation of point source reductions will be accomplished through completion of sewage treatment plant upgrades currently underway as well as final adoption of regulatory programs that are currently being developed by the Department of Environmental Quality.

<u>Regulatory Programs Now Under Development</u>

As described previously in this document, the EPA Chesapeake Bay Program Office published water quality criteria related to dissolved oxygen, water clarity and chlorophyll "a" that will serve as the basis for the revision of water quality standards for the states in the Chesapeake Bay watershed with tidal waters (Maryland and Virginia). The criteria, when achieved, will provide the habitat necessary to protect the bay's fish, shellfish, crabs and other living resources. A notice of intended regulatory action (NOIRA), the first step in the regulatory process to amend water quality standards, was published in the Virginia Register on November 17, 2003. The regulatory process prescribed by the Virginia Administrative Process Act is now underway. The public comment process on the proposed revisions to the standards should take place later this year.

In December 2003, Governor Warner announced the beginning of a regulatory process to establish a range of technology-based nutrient limits in discharge permits within the Chesapeake Bay watershed. The regulation will complement the water quality standards regulation and ensure that the nutrient reductions will occur. A NOIRA for this rulemaking has been published in the Virginia register and the regulatory process has begun.

These concurrent rulemakings will ensure that Virginia has the regulatory tools that define the water quality goals we are committed to achieving for the Chesapeake Bay and its tidal rivers and will serve as the basis for implementation of these strategies.

Accommodating Future Growth

The pollutant loads assigned to point and nonpoint sources must be capped over time. The capacity of existing sewage treatment plants to handle future growth in their communities needs to be assured while at the same time not exceeding the load allocation caps for those particular plants or for an entire river basin. In addition, even if the point source regulation requires that all new plants must achieve limit of technology (LOT) treatment, there is a new load associated with even a LOT facility. Therefore, how can new or expanded treatment plants be accommodated?

Nonpoint source implementation

Nonpoint sources account for the majority of nutrients flowing into the Chesapeake Bay system and at the same time, because of their diffuse nature, they are the most difficult to control. There has been some success in addressing nonpoint sources, but the kind of comprehensive implementation necessary to improve water quality remains elusive. While existing programs, including cost-share programs on agricultural land and the Commonwealth's newly reorganized and expanded stormwater management law, will be brought to bear on nutrient and sediment pollution, better use of existing authorities and an examination of what mix of regulatory and voluntary programs are necessary must begin.

<u>Comprehensive Management of Nutrients and Sediments on Land</u>

The strategies rely heavily on adoption and implementation of nutrient management plans on both agricultural and urban lands. How can consistent and comprehensive application of nutrient management plans on both agricultural and urban lands be achieved?

Are there improvements that can be made to current agriculture nonpoint source control programs to better address nutrient issues? For example, nutrient management plans are currently required by poultry operations that use waste on their own lands. However, nutrient management plans are not required for those who use waste generated on other farms. How should this discrepancy be addressed?

Septic systems are currently an uncontrolled source of nitrogen. Should all newly installed septic systems and replacement systems be required incorporate processes to remove nitrogen from effluent?

Beneficial uses of animal and poultry waste must be more aggressively pursued. Value added products produced from animal or poultry waste or "waste to energy" facilities can help address nutrient issues. How can these approaches be broadly implemented in Virginia?

Buffers along streams and rivers have proven to be an effective practice to reduce nutrients and sediments. In addition to programs such as the Conservation Reserve Enhancement Program that establish buffers on agricultural lands, programs such as the Chesapeake Bay Preservation Act require buffers along perennial streams in Eastern Virginia. What can be done to accelerate the establishment of buffers along Virginia's streams and rivers?

The placement of sewage sludge (sometimes called "bio-solids") on agricultural lands is increasing. Are programs currently in place sufficient to address the impacts of this source of nutrients?

Land use

As these strategies recognize, the landscape is changing. Growth and development will alter the ratio of sources and conversions from less intensive land uses to more intensive uses will continue. These strategies recognize that new methods of land management, particularly low impact development practices, will need to be employed on a much larger scale. This approach must be pursued concurrently with improved enforcement of erosion and sediment control and other traditional land management practices.

How can these news land management practices become integral parts of local land use and land management programs particularly in areas outside those governed by the Chesapeake Bay Preservation Act?

Next steps

Although considerable efforts have gone into the development of this strategy, it is not complete. While we have identified the point and nonpoint source practices necessary to achieve our goals, a good deal of work with regard to the implementation of these practices remains to be done. Following the public comment period, these strategies will be supplemented with additional detail regarding implementation responsibilities, budgets and timetables. We must clearly show how each of the practices proposed can be implemented; first, by showing what existing programs can accomplish with known resources and second by showing what additional resources will be necessary to complete implementation. In addition, detailed progress reports will be made annually to the Governor, the General Assembly and the citizens of Virginia as part of the required annual report on Tributary Strategy implementation.

As the implementation of the strategies proceed, tributary teams and state agencies will assume the following responsibilities.

- Establish process to evaluate progress and success
- Establish specific timeline to achieve pollutant load allocations by 2010
- Guide and prioritize implementation activities
- Refine Input Deck as revised data become available
- Develop outreach initiatives and strategies
- Collaborate with watershed organizations to promote and guide implementation
- Help localities, Soil and Water Conservation Districts, Planning District Commissions and businesses with local and regional watershed planning

State agencies and the tributary teams will also work closely with Planning District Commissions and Soil and Water Conservation Districts and other partners in order to:

- Encourage local governments to adopt and maintain tracking systems to account for the establishment of urban best management practices
- Promote specific strategy components to localities

- Assist in the development and implemention of local watershed plans that support the strategy
- Encourage landowners to implement specific BMPs
- Provide to local governments the technical assistance and analysis of environmental data to support program development and implementation
- Provide technical GIS capability to support local programs
- Promote, coordinate and track agricultural and urban BMPs
- Facilitate consensus among localities in each PDC jurisdiction on strategy development, refinement and implementation

An interagency steering committee operating under the direction of the Secretary of Natural Resources coordinates state oversight of the tributary strategy process. The committee will:

- Re-evaluate strategies, as necessary following the adoption of new water quality standards and based on the scheduled 2007 re-evaluation by the Chesapeake Bay Program.
- Maintain clear lines of communication in state government
- Report on implementation through an annual report
- Better engage federal agency partners
- Prioritize Chesapeake 2000 Agreement commitments that facilitate or support tributary strategy implementation
- Identify data and mapping support needs
- Maintain and enhance state nonpoint source assessment and targeting information
- Target available funding resources
- Promote "government-by-example" activities, such as low impact design for state projects
- Provide ongoing support for local watershed planning activities
- Refine implementation timelines
- Ensure committee composition that includes needed expertise and comprehensive agency input

The challenge is now to turn these plans into reality and to continually refine them so they implement the most effective and efficient methods to achieve our ambitious goals.

Appendices

APPENDIX A: Water Quality Data and Trends

The Virginia Chesapeake Bay and its tidal tributaries continue to show environmental trends indicating progress toward restoration to a more balanced and healthy ecosystem. However, the Bay system remains stressed and some areas and indicators show continuing degradation. Progress in reducing nutrient inputs has made measurable improvements and it is expected that continued progress toward nutrient reduction goals, along with appropriate fisheries management and chemical contaminant controls, will result in additional Bay improvements. Findings from the last 18 years (1985 through 2002) of the monitoring programs are discussed here.

The three major pollutants targeted in the tributary strategy process are nitrogen, phosphorus and sediment. Approximately 85 percent of the nitrogen and 81 percent of the phosphorus loads to the tidal York River originate from nonpoint sources. Most nonpoint source pollutants are runoff from agricultural lands, residential lands and other urban areas. The remaining 15 percent of the nitrogen and 19 percent of the phosphorus loads come from point source discharges (municipal sewage and industrial wastewater plants). Soil erosion is considered 100 percent nonpoint source related. It comes mainly from construction sites and stream banks.

Water quality impacts from excessive inputs of nutrients and sediment include periodic low levels of dissolved oxygen near the mouth of the York and diminished acreage and health of underwater grasses throughout the tidal portion of the river.

This presents a very general overview of selected water quality conditions in the tidal portions of Virginia's Chesapeake Bay and its major tributaries, with a focus on the York River. It is difficult to adequately summarize the York basin's water quality in such a short document. Much more comprehensive and detailed analyses are available for each major Bay basin, and the reader is encouraged to supplement this brief status and trends information with several reports available through the DEQ Chesapeake Bay Program webpage http://www.deq.state.va.us/bay/wqifdown.html and the DEQ Water Programs' Reports webpage http://www.deq.state.va.us/water/reports.html.

Water quality conditions are presented through a combination of the current status and long-term trends for nitrogen, phosphorus, chlorophyll, dissolved oxygen, water clarity, and suspended solids. These are the indicators most directly affected by nutrient and sediment reduction strategies. Environmental information regarding other important conditions in Chesapeake Bay (e.g., underwater grasses, fisheries, chemical contaminants) are available in the 2004 biennial report, "Results of Monitoring Programs And Status of Resources", available via the webpage for the Secretary of Natural Resources http://www.snr.state.va.us/.

The Virginia Chesapeake Bay and its tidal tributaries continue to show environmental trends indicating progress toward restoration to a more balanced and healthy ecosystem. However, the Bay system remains stressed and some areas and indicators show continuing degradation. Progress in reducing nutrient inputs has made measurable improvements and it is expected that continued progress toward nutrient reduction goals,

along with appropriate fisheries management and chemical contaminant controls, will result in additional Bay improvements. Findings from the last 18 years (1985 through 2002) of the monitoring programs are discussed in the sections below.

Nutrients (nitrogen and phosphorus) influence the growth of phytoplankton in the water column. Elevated concentrations of these nutrients often result in excessive phytoplankton production (i.e., chlorophyll). Decomposition of the resulting excess organic material during the summer can result in low levels of dissolved oxygen (D.O.) in bottom waters. These low D.O. levels can cause fish kills and drastic declines in benthic communities, which are the food base for many fish populations. Low-D.O. waters also adversely affect fish and crab population levels by limiting the physical area available where these organisms can live.

Phosphorus: Figure 1 presents current status and long term trends in phosphorus concentrations. Some of Virginia's Bay waters have the poorest conditions in relation to the rest of the Chesapeake Bay system, including a portion of the Mattaponi and the tidal fresh section of the York River. The status of other downstream segments of the York River is fair, but degrading trends are seen in sections of the Pamunkey, tidal fresh York and further downstream.

The "watershed input" stations shown in Figure 1 provide information about the impacts of nutrient control efforts in the upper watershed (above the fall line). Results at these watershed input monitoring stations are flow-adjusted in order to remove the influence of river flow and assess only the effect of nutrient management actions (e.g., point source discharge treatment improvements and BMPs to reduce nonpoint source runoff). Unfortunately, a degrading trend is evident at the Pamunkey watershed input station.

Nitrogen: Figure 2 presents status and long term trends in nitrogen concentrations. Most of Virginia's Chesapeake Bay is showing improving trends in nitrogen, with a few exceptions including the degrading trends seen at the Pamunkey watershed input station and further downstream. Status of nitrogen in much of the York River is considered relatively good, in comparison to conditions in the other major tributaries and the Virginia Chesapeake Bay.

Chlorophyll: Chlorophyll is a measure of algal biomass (i.e., phytoplankton) in the water. High chlorophyll levels are an indicator of poor water quality because they can lead to low D.O. conditions when the organic material sinks into bottom waters and is decomposed. High algal levels can also reduce water clarity, which decreases available light required to support photosynthesis in underwater grasses. High algal levels also can be indicative of problems with the food web such as decreased food quality for some filter-feeding fish and shellfish. Finally, high chlorophyll levels may indicate large-scale blooms of toxic or nuisance forms of algae.

Figure 3 presents the current status and long term trends in chlorophyll concentrations. Parts of all of the major Virginia tributaries, including the York, have poor status in relation to Bay-wide conditions. A degrading trend in chlorophyll was detected in the lower reaches of both the Mattaponi and Pamunkey Rivers, as well as the mainstem York.

Dissolved Oxygen: Bottom dissolved oxygen levels are an important factor affecting the survival, distribution, and productivity of aquatic living resources. Figure 4 shows the current status and long term trends in dissolved oxygen concentrations. Status is given in relation to dissolved oxygen levels supportive or stressful to living resources. About half of the Virginia Chesapeake Bay and smaller portions of the tidal tributaries had only fair status. The lower York River and lower reach of the Mattaponi are also indicated as fair status. In the lower York, this is due to depressed D.O. concentrations periodically found in the deep sill that exists near the mouth of the river. These deep sills and trenches have naturally lower D.O. levels, but the area affected and duration of low dissolved oxygen levels has been made worse by anthropogenic nutrient inputs.

There are scattered areas of improving conditions for dissolved oxygen and no areas of degrading trends. All of the tributaries have areas of improving conditions. These improvements are a result of both the nutrient management efforts and natural factors, such as declining riverflow, which in turn has lead to less nutrient inputs and concurrently higher influxes of cleaner oceanic water.

Figure 1) Total Phosphorus Status and Trends

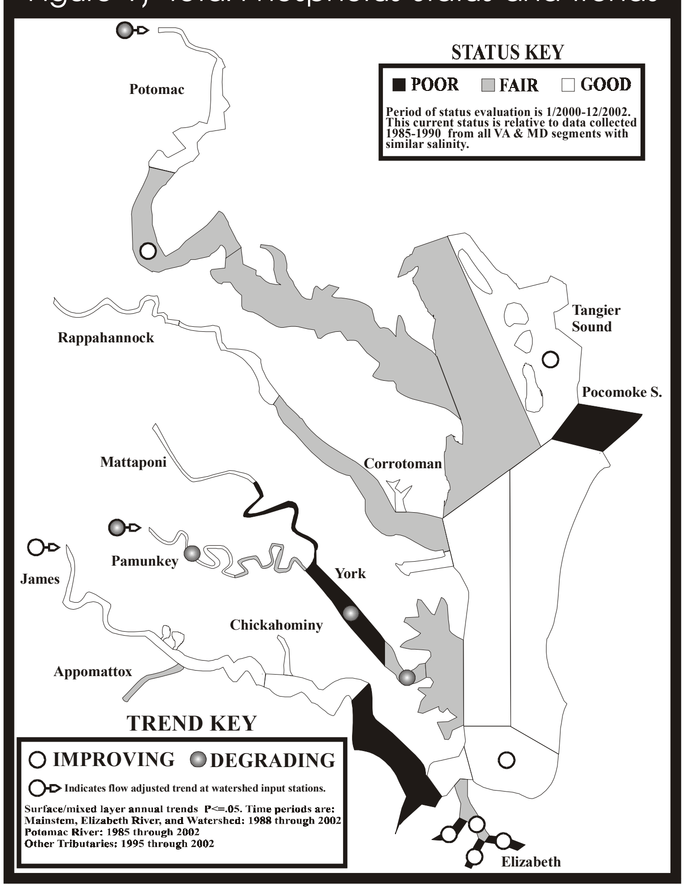


Figure 2) Total Nitrogen Status and Trends

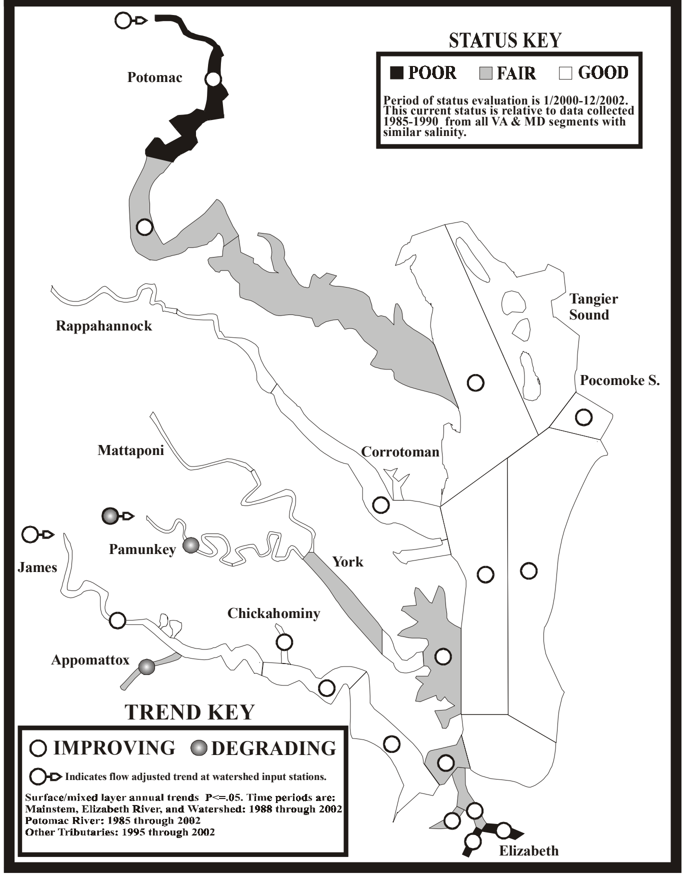


Figure 3) Chlorophyll Status and Trends

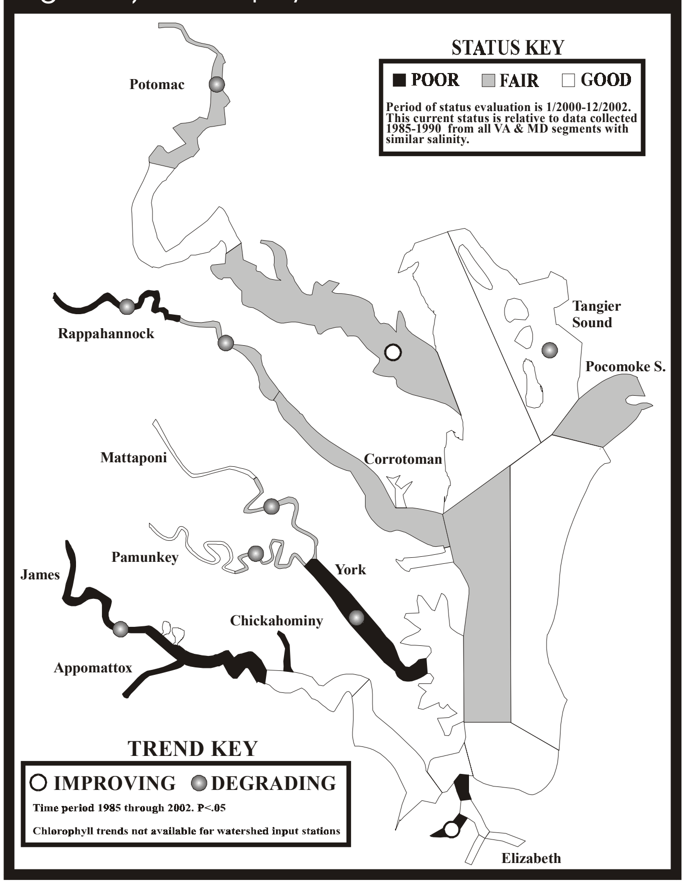
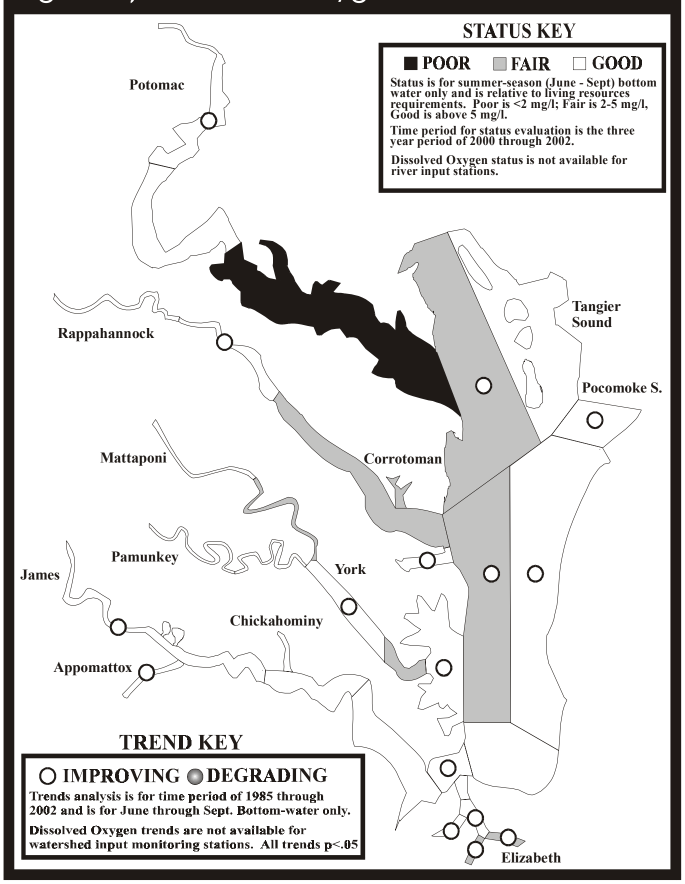


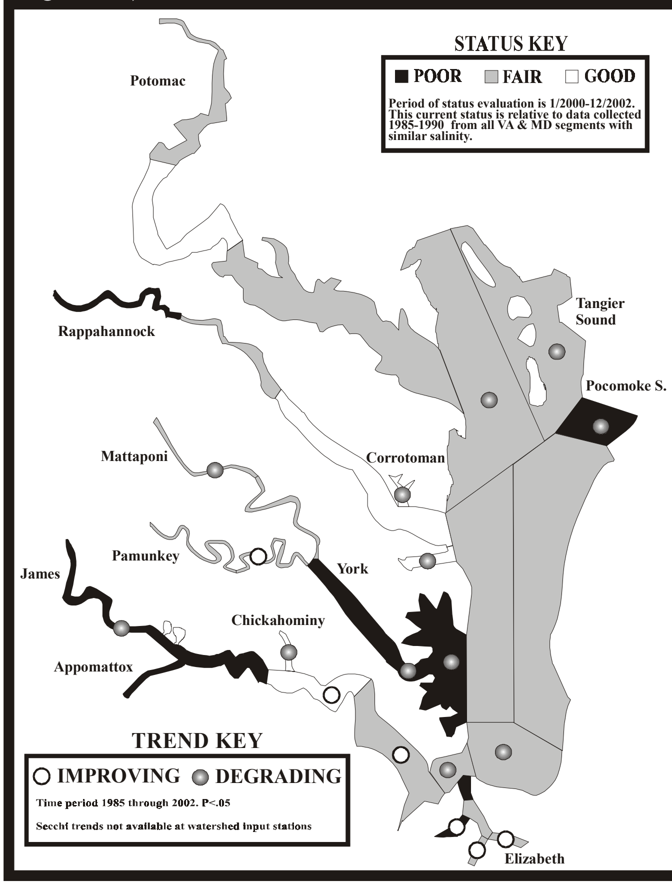
Figure 4) Dissolved Oxygen Status and Trends



<u>Water Clarity</u>: Water clarity is a measure of the depth to which sunlight penetrates through the water column. Poor water clarity is an indication that conditions are inadequate for the growth and survival of underwater grasses. Poor water clarity can also affect the health and distributions of fish populations by reducing their ability to capture prey or avoid predators. The major factors that affect water clarity are: 1) concentrations of particulate inorganic mineral particles (i.e., sand, silt and clays), 2) concentrations of algae, 3) concentrations of particulate organic detritus (small particles of dead algae and/or decaying marsh grasses), and 4) dissolved substances which “color” the water (e.g., brown humic acids generated by plant decay). Which of these factors most greatly influence water clarity varies both seasonally and spatially.

Figure 5 presents the current status and long term trends in water clarity. Status of many segments within the tributaries and the Chesapeake Bay mainstem is only fair or poor, and this is evident in the York basin, with fair status in the Mattaponi and Pamunkey Rivers, and poor status along the York River and in Mobjack Bay. This suggests that poor water clarity is one of the major environmental factors inhibiting the resurgence of underwater grasses in Chesapeake Bay. Degrading trends in water clarity were detected over a wide geographic area within Virginia's tributaries and Chesapeake Bay, including the Mattaponi, mouth of the York, and Mobjack Bay. These degrading trends represent a substantial impediment to the recovery of grass beds within Chesapeake Bay. An improving trend in water clarity was evident in the Pamunkey River. Possible causes of the degrading trends include increased shoreline erosion as a result of waterside development, loss of wetlands, increased abundance of phytoplankton, or a combination of sea level rise and land subsistence.

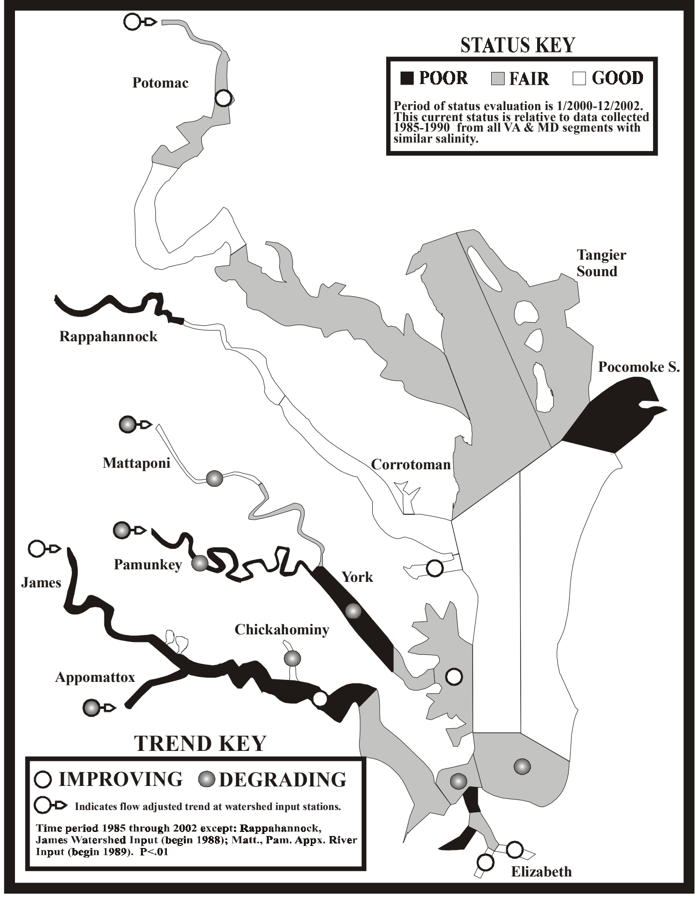
Figure 5) Water Clarity Status and Trends



Suspended Solids: Suspended solids are a measure of particulates in the water column including inorganic mineral particles, planktonic organisms and detritus, which directly controls water clarity. Elevated suspended solids can also be detrimental to the survival of oysters and other aquatic animals. Young oysters can be smothered by deposition of material and filter-feeding fish such as menhaden can be negatively affected by high concentrations of suspended solids. In addition, since suspended solids are comprised of organic and mineral particles that may contain nitrogen and phosphorus, increases in suspended solids can result in an increase of nutrient concentrations.

Figure 6 presents the current status and long term trends in suspended solids concentrations. All of the major Virginia tributaries have segments that are fair or poor status, including the York River system (Mattaponi, Pamunkey, and York). The York basin has particularly widespread degrading trends for suspended solids, with the exception of Mobjack Bay. Both the Pamunkey and Mattaponi watershed input stations also showed degrading trends.

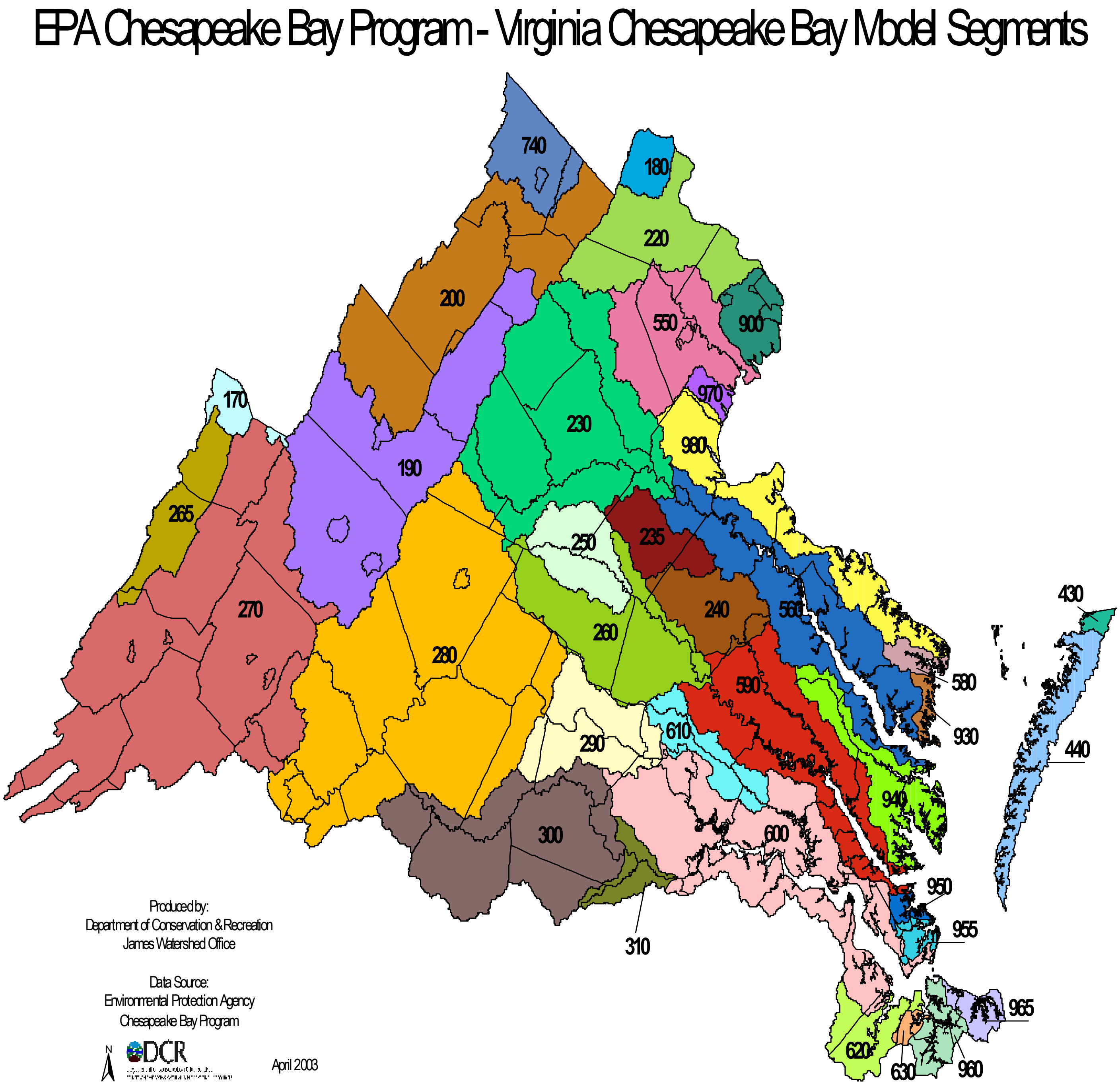
Figure 6) Suspended Solids Status and Trends



APPENDIX B: Building on Accomplishments

While this tributary strategy is a basin wide plan, individual input decks were developed for each of the watershed model segments. As seen in Figure 4, the York watershed is divided into six segments, 235, 240, 250, 260, 590, and 940. The segments were then aggregated to develop allocations on a basin wide scale. The input deck is, therefore, outlined by model segment and by total basin.

Figure 4: Map of Virginia Chesapeake Bay Model Segments



The Bay Program partners established the year 1985 as the baseline from which all nutrient and sediment reductions would be calculated resulting from implementation of BMPs. Several significant benchmark years have been identified to include 1996 and 2002. 1996 was used as the benchmark year for the original tributary strategy and 2002 is the benchmark year for the revision process. The findings of these evaluations indicate that the voluntary implementation of BMPs resulted in meaningful and tangible progress in all sectors. However, as the benchmark years indicate, the rate of implementation and associated reductions are not sufficient to reach the recently established load allocations.

Due to BMP implementation and water quality improvements in both nonpoint and point source sectors, the overall nutrient loads have decreased, as noted in Table 1. As of 2000, approximately 80 percent of the nutrients emptying into the York were coming from nonpoint sources. Current trends indicate that approximately 85 percent of the nutrient loads now originate from nonpoint sources and the remaining 15 percent comes from point sources.

From 1985 to 2000, York stakeholders reduced nitrogen by 12 percent, phosphorus by 33 percent, and sediment by 18 percent. Significant reductions were realized during this period through both point and nonpoint source programs. As observed in Table 1, the progress from 1985 to 2000 is roughly equivalent to the effort needed to achieve the new goals by 2010.

Table 1: York Basin Reductions and Allocations

	1985 Load	2002 Load	Cap Load	Additional Reductions To Meet Cap
Nitrogen (lbs)	8,928,321	7,679,383	**5,700,000**	1,979,383
Phosphorus (lbs)	1,151,330	749,445	**480,000**	269,445
Sediment (tons)	157,677	126,987	**102,534**	24,453

Wastewater treatment plant operators, local governments, landowners, watershed groups, businesses, and citizens have made significant progress since the original strategy was developed in 2000. The revised strategy has accounted for this progress and is intended to build upon specific successes in the York. In particular, the York stakeholders have made significant progress toward establishing and implementing local watershed management plans. This Tributary Strategy accounts for and continues to advance this movement in the York watershed.

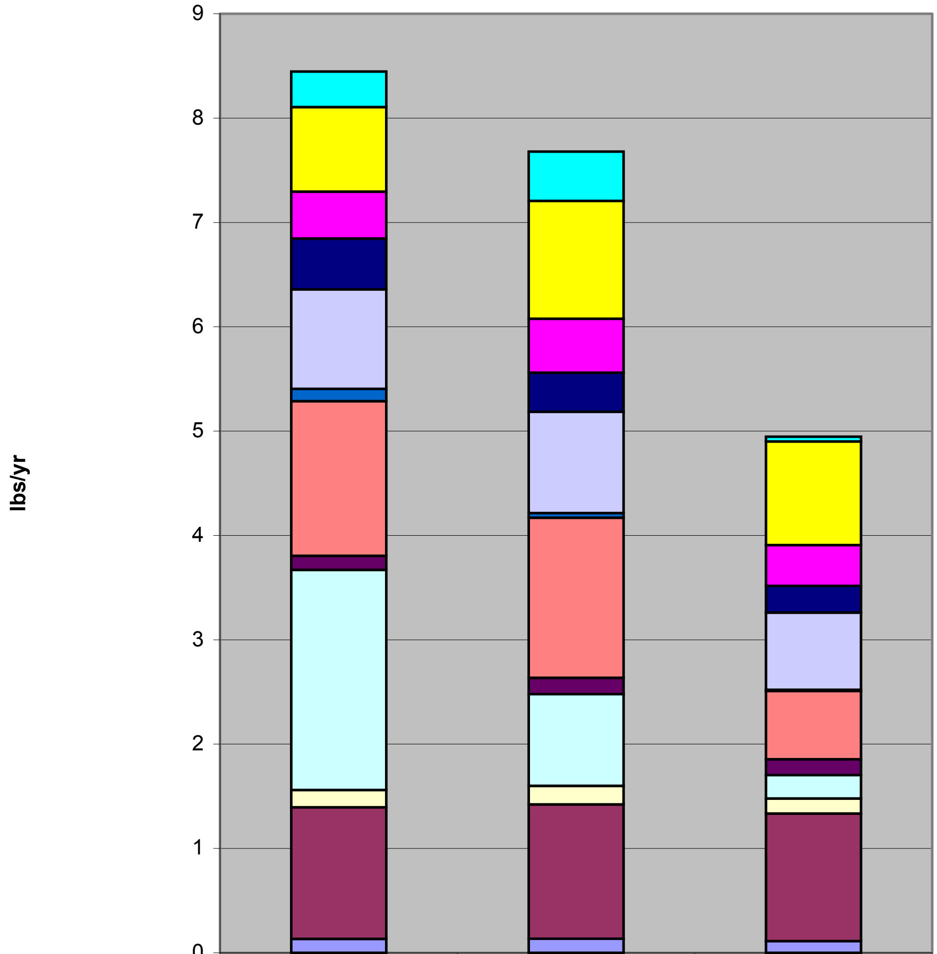
Agricultural BMP implementation has been exceptional between 1985 and 2000. Generally, signup at soil and water conservation districts is higher than available funds. With increased funding, implementation would substantially improve. As indicated in the charts by source category, Figures 5 – 7, agricultural and point source loads have seen the greatest reductions. Cropland, in particular, has realized significant nitrogen and phosphorus reductions. In addition to nutrient reduction, practices placed on crop and pasturelands have significantly decreased sediment loads. Upgrades at point source facilities have also contributed to improving nitrogen and phosphorus loadings. Conversely, as the York watershed's urban and mixed open lands grow in acreage, the loads of all three pollutants continue to increase.

As previously noted, land use changes between 2002 and 2010 will be minimal. However, the trend of agricultural land being converted to urban and mixed open land uses will continue. While this strategy targets pollution from existing sources, it also targets those growing land uses between 2002 and 2010. Therefore, a significant portion of our efforts must be devoted to preventing and reducing loads on these small but expanding land uses.

For the significant York River point sources, since the 1985 baseline year the annual discharged loads of nitrogen and phosphorus have decreased by about 13 percent, and 63 percent, respectively. Much of the nutrient reduction is attributable to changes at the largest industrial source of nutrients (Smurfit-Stone), which decreased its discharge of nitrogen by 66 percent and its phosphorus load by 82 percent.

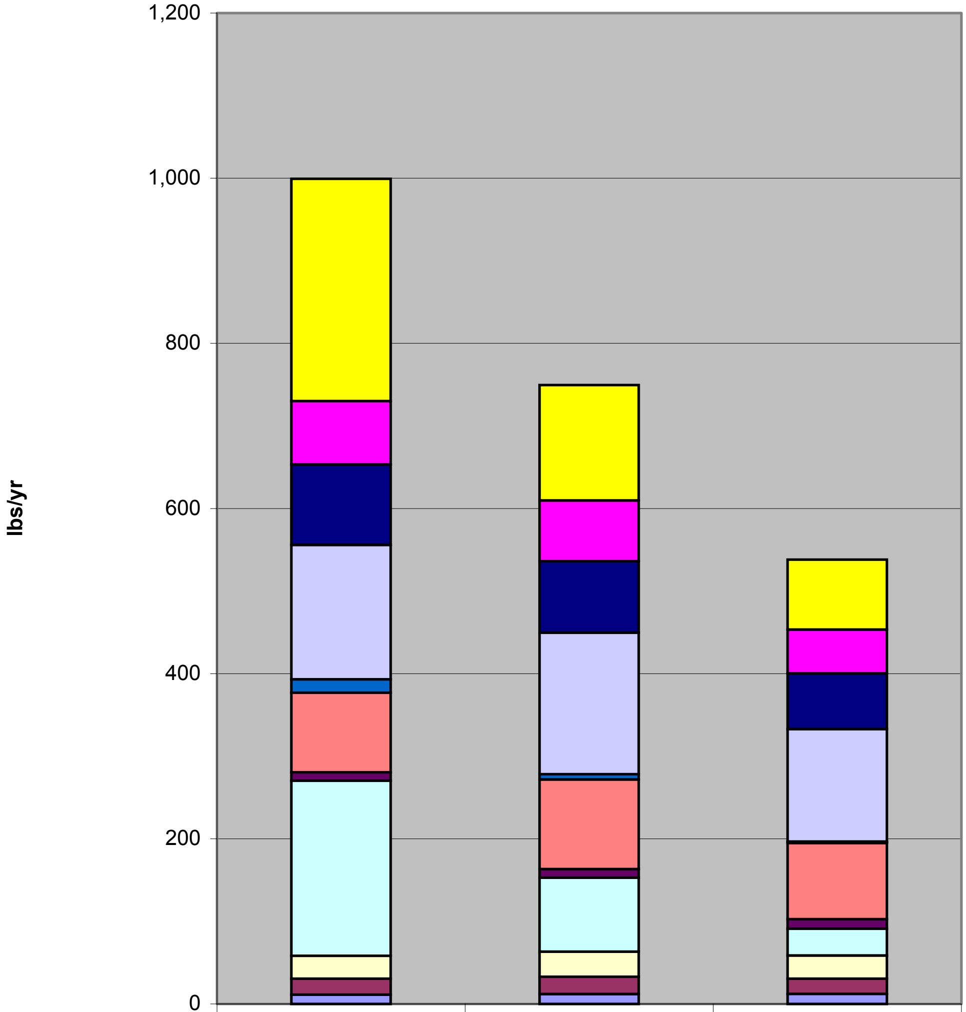
The flow volume being treated at the significant municipal wastewater plants in the York basin has been increasing since 1985, due to population growth and expansion of sewer service areas. Although the nutrient controls installed to date have slightly decreased the nitrogen load, and significantly lowered the phosphorus load, additional controls will be needed to offset further growth in the future and maintain the "cap" on point source discharges.

Figure 5: Total Nitrogen in York Watershed by Source Category



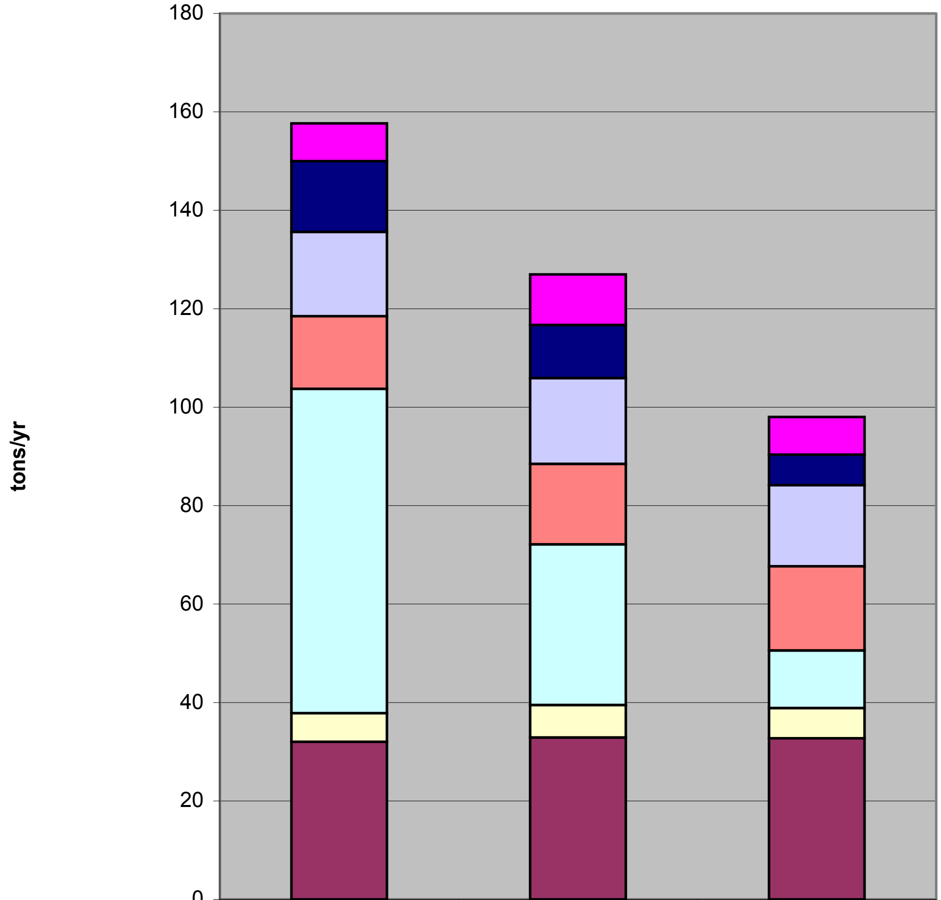
	1985	2002	2010
Septic	341,050	472,197	46017
Point Source	810,069	1,129,296	993795
Perv Urban	449,440	517,253	390823
Pasture	488,075	374,196	256731
Mixed Open	952,938	971,711	739322
Manure	118,131	44,059	11865
Low Till	1,481,156	1,534,569	653806
Imp Urban	134,963	156,941	151454
High Till	2,110,197	879,082	223906
Hay	165,632	178,189	144356
Forest	1,261,913	1,286,282	1222722
AT Dep Water	132,839	135,610	112,314

Figure 6: Total Phosphorus in York Watershed by Source Category



	1985	2002	2010
Septic	0	0	0
Point Source	269,175	139585.72	84759
Perv Urban	76,702	73735.31	52943
Pasture	97,446	86639.31	67516
Mixed Open	162,814	171249.21	136197
Manure	16,274	6316.3	1762
Low Till	96,164	108541.95	92136
Imp Urban	10,332	10567.87	11780
High Till	212,051	89355.93	32312
Hay	27,568	30486.17	28164
Forest	19,375	20956.18	18339
AT Dep Water	11,301	12011.25	12,196

Figure 7: Total Sediment in York Watershed by Source Category



	1985	2002	2010
Septic	0	0	0
Point Source	0	0	0
Perv Urban	7658.89	10284.14	7618
Pasture	14382.84	10777.2	6225
Mixed Open	17123.1	17429.08	16482
Manure	0	0	0
Low Till	14751.95	16357.82	17105
Imp Urban	0	0	0
High Till	65923.9	32630.51	11696
Hay	5799.27	6619.26	6146
Forest	32027.2	32889.04	32728
AT Dep Water	0	0	0

Appendix C: York Tributary Strategy Considerations and Recommendations

Development, and ultimately implementation, of this strategy has been predicated upon a number of assumptions, such as adequate funding and continued support by state and federal agencies. In addition, it is assumed that as new data, resources, and technologies become available the strategy will be adapted to incorporate and account for these advances. To accurately reflect regional concerns, the York Tributary Team identified and discussed a number of considerations and recommendations to successfully implement the tributary strategy.

The team then generated a list of general "Development and Implementation Considerations" and a list of York basin specific recommendations. The implementation considerations are broader in nature and address general assumptions that should be addressed by the state, the Chesapeake Bay Program, and all stakeholders. To complement these considerations, the team also developed a specific list of recommendations that will directly contribute to the success of the York Tributary Strategy.

Considerations in Development & Implementation of the Tributary Strategy:

- Water Quality Concerns: The York Tributary Strategy was developed prior to adoption of revised Virginia water quality standards. Therefore, the level of management action to support the revised water quality standards is undefined. The Tributary Strategy will be further evaluated upon completion of the water quality standards adoption process and the technology-based regulation for point sources. Given these circumstances the nutrient allocations contained in this document should be viewed as "place-holders" and should not be used for regulatory purposes (i.e. permit limits, etc.) pending the completion of the water quality standards process.
- Flexibility of Implementation: The levels of implementation and associated BMPs proposed in the Tributary strategy are designed to reflect what is necessary to meet the goals under currently accepted BMPs and efficiencies. As the Chesapeake Bay Program adopts new BMPs, technologies, and/or implementation strategies, the Tributary Team will revise the York Tributary Strategy to reflect these advances. Additional innovative options (i.e. environmental credits, watershed permits and nutrient trading) in support of increased application and efficient implementation of resource conservation practices will be evaluated and included into the Strategy as appropriate.
- Assigned BMP Efficiency Process: It is the consensus within the York Roundtable that the evaluation process of new BMP technologies should be of a transparent nature and held as a high priority. The York Tributary Strategy Team should have the ability to identify and prioritize new technologies. It is recommended that a State BMP Task Force be assembled to foster the advancement of pollution removal technologies.
- Resources for Implementation: The proposed level of implementation and associated BMPs, as well as prospective BMPs and strategies, is expressly contingent upon adequate resources. To reach the 2010 goals significant financial, political, and

personnel resources will need to be identified and provided to the implementers both in the short term and the long-term.

- Federal Facilities: Due to the nature of the operations on some of the federal facilities within the watershed, it is commonly not feasible to comprehensively catalog the existing Best Management Practices on site. While the state cannot mandate this Tributary strategy initiative on federal facilities, it is recommended that federal agencies be encouraged to implement management actions that are consistent with the efforts outlined in the tributary strategy.
- Multiple Natural Resource Concerns: Tributary strategies should identify BMPs that address multiple resource concerns. It is recommended that further research be conducted on the potential for more efficient investments towards the "cocktail" of BMP impacts. Given the magnitude and diversity of challenges (i.e. nutrient transport, sediment loading, groundwater withdrawal, atmospheric deposition and base flow flux) a more comprehensive approach is warranted. This will also allow for greater flexibility and regional specificity in revising strategies that address water quality criteria.
- Inherent Ecological Controls: The Chesapeake 2000 agreement contains specific recommendations for considering the living aquatic population's (i.e. oysters and menhaden) filter feeding ability to exponentially improve and maintain water quality. Similarly, in terrestrial ecology, improved soil quality (increased soil carbon) provides a more suitable habitat for beneficial organisms (i.e. earthworms, fungi and bacteria) that provide inherent hydrology and pollution controls.

Recommended Actions for Successful Implementation of York Strategy:

- Continuous no-till should be given efficiencies with greater nutrient reduction values than other conservation tillage practices. Other BMPs currently without efficiency rates should be further researched and approved to gain additional nutrient reductions.
- More flexibility in the BMP specifications should be given to counting voluntary BMPs that are not currently tracked. Develop a procedure to track voluntary BMPs through farmer surveys and other means.
- The strategy should allow for nutrient reductions from wildlife plantings (WL practices) and should count land conversions from farmland to permanent wildlife habitat towards nutrient reductions.
- The strategy should allow for nutrient reductions from streamside fencing and other practices that do not meet NRCS or DCR practice specifications but still provide nutrient and erosion reductions.
- Emphasis should be placed on basin wide environmental education initiatives. Seek greater financial resources to support a stronger environmental education initiative in Virginia for both agricultural and non-agricultural programs.
- Offer property tax reductions as an incentive to install BMPs especially for those farmers who have not historically participated in cost-share programs.
- Offer better property tax incentives or easement programs to keep land in agriculture/forestry land use rather than be sold for development.
- Track and provide efficiencies for urban BMPs that have not been tracked historically. Develop and provide efficiencies for the installation of LID technology.
- Provide funding for additional staff necessary to implementation and track BMPs.

- Provide nutrient reductions for harvested cover crops.
- Re-evaluate assessments on property that comprises Chesapeake Bay Preservation Act buffer areas. Currently, they are assessed as farmland and probably should be assessed as recreational lands.
- Better targeting and promotion of high priority BMPs.
- Establish a system for tracking land conversions.
- Re-establish private plan-writer nutrient management plan cost-share program.
- Establish a large-scale manure transport program supported by the state.
- Piggyback additional incentive with CREP to cost-share 100 percent of the installation costs as well as an increase in the land rental rate of cropland conversion to forested or grassland buffers through CREP.
- Organize a promotional program in the bay watershed for the establishment of conservation easements.
- Establish a cost-share practice to fund SAV plantings.
- Investigate the viability of a program that financially addresses failing septic systems.
- Conduct comparative monitoring of urban/suburban watersheds to assess true water quality impacts from these two land uses in Virginia. From this effort or if this data already exists, widely distribute the results to help conservationists sell the need of BMPs in each type of land use.
- Develop nutrient management plans for horse farms.
- Provide for improved nutrient management and BMP tracking on golf courses.
- Pursue action either through the legislature or through agency channels to insure that nitrogen reductions are considered when permitting small flow wastewater systems.
- Restore money to the Water Quality Improvement Fund for point and nonpoint source reduction efforts.

Regarding **point sources**, the Commonwealth is particularly interested in receiving public comment on the following Tributary strategy implementation issues:

1. As described in Section III (Implementation Scenario), there are many treatment level combinations for the affected significant facilities that could achieve the desired load reductions in each basin. For simplicity and equity the point source nitrogen and phosphorus discharge levels proposed for each tributary basin generally assume uniform nutrient reduction treatment at the municipal plants, and equivalent controls at the industrial plants. However, this may not be the most cost effective or appropriate means of achieving the desired water quality objectives. Therefore, this scenario does not set load allocations for each individual plant -- what is sought is an aggregate point source load across each basin that the plants would maintain into the future.

   The process for setting the individual plant allocations, and procedures to establish numerical discharge permit limits for nutrients will be informed and assisted by a rulemaking now underway to revise the State Water Control Board's "Point Source Policy for Nutrient Enriched Waters". Information on revising this regulation can be found on the DEQ Chesapeake Bay Program's webpage, at this Internet address: www.deq.state.va.us/bay/multi.html.

In setting the effluent levels at individual treatment plants consideration must be given to the current limits of technology for nutrient removal. For example, what decision rules should guide the assignment of the nitrogen load allocation for point sources given the barrier of the current limit of technology (TN = 3 mg/l)? This barrier prevents treatment plants from accepting new wastewater flows that would require treatment below TN = 3 mg/l in order not to exceed their loading "cap". [NOTE: some treatment plants may not physically be capable of achieving TN = 3 mg/l, so their barrier is at a higher concentration].

In addition, is it acceptable to assign a nitrogen load allocation if it would require treatment plants to achieve TN = 3 mg/l at current design flow? Is it acceptable if the assigned nitrogen load allocation would require treatment levels below 3 mg/l at the current design flow of the plant?

What is the appropriate planning horizon [5 years, 10 years, 20 years?] for placing treatment plants in the position that growth in the community cannot be served at their facility since accepting new flows would require treatment levels below the current limit of technology to maintain the assigned nitrogen load allocation? If municipal wastewater plants are not able to serve future flows in their community, then development may be forced into rural areas served by septic tanks (whose loading is not regulated under any allocation) which can have impacts on farm and forest land preservation.

2. How will loads from new treatment plants be accommodated? Even if the point source regulation requires that all new plants must achieve limit of technology (LOT) treatment, there is a new load associated with even a LOT facility.

   Should a portion of the point source nitrogen load allocation for each basin be set-aside (reserved) for new treatment plants (e.g., 1 percent, 3 percent, or 5 percent)? These plants may be proposed in communities that currently do not have a "share" of the load allocation since there are no existing treatment plants in that locality. If new plants are required to meet LOT treatment, for every 100,000 pounds per year of allocation held in reserve, 11 MGD of new flow could be accommodated. In the York basin, it is estimated that the following reserve amounts would allow for the additional TN loads and flow shown:
   - 1% reserve = 57,000 lbs/yr; 6.2 MGD
   - 3% reserve = 171,000 lbs/yr; 18.7 MGD
   - 5% reserve = 285,000 lbs/yr; 31.2 MGD

   Without a reserve, new plants would have to "buy" their way into the river basin allocation by finding offsets to their new loads. Is this equitable to those communities?

3. The estimated costs to meet the nutrient reduction goals are high, and there are significant limitations on the availability of cost-share grant funds through the

Virginia Water Quality Improvement Fund to assist the plant owners and localities to fund Strategy implementation. Financial support is also available from the State Revolving Loan Fund, which offers low (possibly even zero) interest loans for wastewater treatment system improvements. How should the pace of point source nutrient reduction be scheduled in relation to funding assistance from State and Federal sources?

Appendix D: York Tributary Team Participants and Meeting Schedule

Name	Organization	Ag. Com.	PS Com.	Urban Com.
	Colesville Nursery			
Anderberg, Mike	Friends of Dragon Run			
Bacot, Jr., Dan M.	York River Yacht Haven			
Banks, Terry	Fort A.P. Hill - Wilcox			
Beale, David	DCR			✔
Bell, John	Tri-County/City SWCD	✔		
Bennett, Connie	York County			✔
Bland, Rod	Wormley Creek/TOGA			
Bloxom, Mo	Southern Landscaping			
Brann, Craig	Three Rivers SWCD	✔		
Bushing, Mark	DEQ		✔	
Calhoun, Laverne	Tidewater SWCD			
Camp, Dan	Severn River Marina, Inc.			
Candeto, Jim	Louisa County			
Carter, Michelle L.	Three Rivers SWCD	✔		
Christie, Gary F.	New Kent County			
Conner, Sharon L.	Hanover-Caroline SWCD	✔		
Cook, P.E., Darryl E.	James City County Compliance Division			
Criblez, Matt	DCR			
Croghan, Moira	DCR			
Culley, Jr., Charles M.	Middlesex County			
Cumbia, Dean	Department of Forestry			
Davis, Paul	VCE			
Davis, E. Wayne	DCR	✔		
Davis, Michael A.	Ashland, Town of			
Demuth, David	Department of Health			✔
Drake, Anna	York County			
Edmonds, Ann	Hanover-Caroline SWCD			
Ehrhart, Robert W.	DEQ		✔	
Ellis, Thomas I.	GAIA International			
Fisher, Gef	Fort A.P. Hill - Wilcox		✔	
Fisher, Courtney R.	New Kent County	✔		✔
Fix, Christine Holt	Richmond Regional PDC			✔
Fleet, John	Piankatank Golf Club			
Fuss, David	Middle Peninsula PDC	✔		
Goss, Ric	Spotsylvania County			
Gowan, Charles	Randolph-Macon College			
Groth, Jr., Carl H.	Lake Anna Civic Association			
Hachey, Ronald	King and Queen County			
Harksen, Jr., Frank	Hanover County Dept. of Public Utilities		✔	
Herman, Julie	William & Mary, VIMS	✔		
Herzog, P.E., Steven P.	Hanover Co. Dept. of Public Works			
Howell, Jennifer S.	DEQ		✔	
Hudgins, John	York County			
Hunley, William S.	HRSD		✔	
Jeronimus, Beth	Hampton Roads PDC			✔
Jones, Claire	Town of West Point			
Kennedy, John	DEQ		✔	

Name	Organization	Ag. Com.	PS Com.	Urban Com.
Kube, Jr., C. Edward	Louisa County			
Lawrence, Lewis	Middle Peninsula PDC			
Layer, Marilyn W.	Tidewater SWCD			
Lee, Carissa	King & Queen County	✔		
Lewis, Matt	VCE	✔		
Linderman, Curt	DEQ		✔	
Lintecum, C. Lee	Louisa County			
Loving, Charles	New Kent Public Utilities			
Majette, Kilby	NRCS	✔		
Manster, Stephen H.	RADCO			
Markwith, Glenn	Department of Defense			
Martin, Steve	Williamsburg, City of			
May, Julie	DCR			✔
McReynolds, James	York County			
Messner, Patricia	Spotsylvania County			
Miller, Nancy	CBLAD			✔
Mills, Billy	York Watershed Forum			
Misslbeck, Heidi	Orange County			
Moody, Marian	Hanover-Caroline SWCD	✔		
Morrison, George	Louisa, Town of			
Moss, Terry	DCR	✔		
Nelson, Don	Thomas Jefferson SWCD			
Noyes, W. Brian	Colonial SWCD	✔		
Palmore, Jennifer	DEQ		✔	
Partin, John				
Pattie, Dudley M.	Rapidan Service Authority		✔	
Pavlich, David C	Giant Yorktown, Inc.		✔	
Peaks, Ron	County of Gloucester			
Phelps, Alvin	NRCS			
Pickett, Robert	VA Dept. of Transportation			
Pleva, Frank A.	King William County			
Pyne, James	HRSD			
Rae, Scott	Tidewater SWCD	✔		
Ramsey, Allen T.	Caroline Regional STP			
Roberts, Thomas J.	Smurfit Stone		✔	
Romanello, Anthony	West Point, Town of			
Slack, David	Department of Forestry	✔		
Stafford, Matt	Caroline County			
Street, Richard	Tri-County City SWCD			
Taylor, John	Spotsylvania County			
Thomas, Bryant	VA Dept. of Env. Quality			
Tyrrell, Pat	RC&D			
Valverde, Hugo R.	Hampton Roads PDC			
Vandewater, Mark	Rappahannock-Rapidan RC			
Van Gelder, David	Hanover County			
Vanlandingham, Mike	DCR			
Walker, Matthew L.	King William County			✔
Walker, Jeffrey	Rappahannock-Rapidan RC			
Wallace, Jim	Colonial SWCD	✔		
Wallace, Christine	Atlantic Division Naval Facilities Eng.		✔	✔

Name	Organization	Ag. Com.	PS Com.	Urban Com.
	Command			
Whaley, Steve	Smurfit Stone		✔	
Whitley, William H.	Gloucester County			
Wichelns, Greg	Culpeper SWCD			✔

York River Tributary Strategy Meeting Schedule

Kickoff Meeting: July 31, 2003
Virginia Institute of Marine Science

September 18, 2003
Aylett Fire Department

October 30, 2003
Aylett Fire Department

November 20, 2003
Aylett Fire Department

December 11, 2003
Aylett Fire Department

January 9, 2004
Aylett Fire Department

February 12, 2004
Aylett Fire Department

March 11, 2004
Aylett Fire Department

April 14, 2004
Aylett Fire Department